

APPENDIX C—TECHNICAL REVIEW COMMENTS

| Row | Section | Page | Line | Technical Review Comment |
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| C1 | Abstract | III | | The abstract should summarize the scope and main points in the Manual, and shorten or cut the extensive paragraph about the process (and participants) who created it. The multiagency aspect is, of course, significant but more appropriate in an Executive Summary. It also already appears in two other places in the front matter (Notice, Acknowledgments). |
| C2 | 1.1 | 1-1 | 6 | The document states that failing to remediate a radioactively contaminated site could be costly in many ways. It should also note that going too far in the remediation process is costly as well. |
| C3 | 1.1 | 1-1 | 12-14 | "MARLAP provides guidance in the planning, implementation and assessment phases for those projects that require the laboratory analysis of radionuclides." This is but the first time that this sentence appears in Chapter 1; altogether it appears 6 times, which is a few times too often. Although appropriate here, some of the other occurrences should be deleted. |
| C4 | 1.1 | 1-1 | 17 | Is this Volume I, as indicated on the cover, or Part I, as listed here? Personally, I vote for Volume instead of Part, particularly since Chapter 15 also has a Part I and II. |
| C5 | 1.1 | 1-1 | 24 | Decide whether this should refer to Volume II, as indicated on its cover, or Part II, as listed here. |
| C6 | 1.1 | 1-1 | 29-31 | Replace lines 29-31 with the following text: "...analytical procedures but rather is intended to provide information on many of the options available for analytical measurements, and ..." |
| C7 | 1.2 | 1-2 | 40-56 | This paragraph is about twice as long as it should be. All of its concepts are stated twice, with excessive overlap in the wording of consecutive sentences. And then the same concepts are echoed yet again in the bullets on lines 58-68. |
| C8 | 1.2 | 1-2 | 51-52 | Repeat of the sentence from the previous page (lines 12-14). It could be deleted without any loss of information. |
| C9 | 1.2 | 1-2 | 52-56 | All of these final sentences in this paragraph should probably be deleted for being repetitious of the first part of the paragraph. |
| C10 | 1.2 | 1-3 | 69-71 | Very similar to sentences on the previous two pages (lines 12-14, 40-42 and 51-52), as well as its wording being echoed in lines 73-79. It could be deleted without any loss of information. |
| C11 | 1.3 | 1-3 | 91 | It would be useful here to expand upon the relationship between MARLAP and MARSSIM, their areas of overlap as well as their differences in scope and coverage. A table might be the best way to show this comparison and linkage. |
| C12 | 1.3 | 1-4 | 103-104 | Very similar to sentences on the previous three pages (lines 12-14, 40-42, 51-52, 69-71). |
| C13 | 1.3 | 1-4 | 106-108 | It would be appropriate to mention here that MARSSIM does provide guidance on these issues (or make this clear in the proposed table mentioned in the comment for line 99). |
| C14 | 1.4 | 1-4 | 111 | I think it would be better to move section 1.5 to precede section 1.4. Otherwise, one wades through 10 pages of discussion on terminology before finally seeing how all the pieces are supposed to fit together. A figure showing "the big picture" should also be introduced at this point. Possible contenders are Figures 1.1 or 1.3 in MARLAP, Figure D-2 from MARSSIM, or something similar to Figure 1 in the Panel's review report. |
| C15 | 1.4.1 | 1-4 | 123 | Insert a new introductory sentence that clarifies the connection between MARLAP and the data life cycle, e.g., "MARLAP implements the data life cycle approach for the specific case of radionuclide data." |
| C16 | 1.3 | 1-4 | 99 | It would be useful here to be more explicit about what MARLAP does and does not cover, similar to Table 1.1 in MARSSIM as an example and perhaps combined with the table suggested in the comment for line 91. |
| C17 | 1.4.1 | 1-5 | 133-135 | Delete the last sentence; it is unnecessary for this discussion of the data life cycle and repetitive of numerous other occurrences of this wording in this chapter. |
| C18 | 1.4.1 | 1-5 | 136-155 | This paragraph is about twice as long as it should be due to excessive and distracting overlap in the wording of consecutive sentences. |

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| C19 | 1.4.1 | 1-5 | Fig 1.1 | Figure 1.1 is misleading because it implies a linear process; in reality, the data life cycle process has numerous feedback loops. |
| C20 | 1.4.2 | 1-6 | 161 | Delete unnecessary verbiage: "While MARLAP recommends and promotes the use of a directed planning process," This wording is a distracting echo of that used just 4 lines earlier (line 157) |
| C21 | 1.4.3 | 1-6 | 168-179 | All of the ideas in this first paragraph are repeated in the second one. This first paragraph should be altogether deleted. |
| C22 | 1.4.3 | 1-6 | 173-175 | Very similar to sentences on the previous 5 pages (lines 12-14, 40-42, 51-52, 69-71, 103-104) |
| C23 | 1.4.3 | 1-6 | 187-188 | Delete the sentence, "MARLAP provides guidance in all three of these areas." Throughout section 1.4, the focus should be on discussing the title concept in each subsection, and that discussion should not be diluted with side comments about MARLAP. |
| C24 | 1.4.4 | 1-7 | 198-201 | This phrase states that " <i>MARLAP does not provide general guidance on the sampling process, except for brief discussions of certain activities that affect the analytical process...</i> " However in later chapters, there are recommendations on sampling, e.g., the recommendation to sample milk from downwind cows in section 10.3.4.1. |
| C25 | 1.4.4 | 1-7 | Fig 1.2 | Fig 1.2 is identical to Fig 3.1 on page 3-3 and very similar to Fig 6.1 on page 6-3. Personally I like Fig 6.1 best (although I may be biased by its larger font size) because it illustrates the distinction between the analytical "process" and "method". |
| C26 | 1.4.4 | 1-7 | Fig 1.2 | Figures 1.2 and 1.3 are static and linear; these should have feedback loops to more clearly convey the sense of the process of continual reassessing and fine-tuning the objectives and approaches. |
| C27 | 1.4.6 | 1-8 | 248 | Many analytical methods do not require "... <i>sample digestion...</i> " as implied here. When speaking generally of the analytical method, it would be more inclusive to refer to <i>sample preparation and counting</i> . |
| C28 | 1.4.4 | 1-8 | 229-232 | This paragraph could probably be deleted. |
| C29 | 1.4.5 | 1-8 | 241-243 | Replace this sentence with the shortened one: "A number of alternative protocols might be appropriate for a particular process." This is true regardless of whether or not a performance-based approach is being used. |
| C30 | 1.4.5 | 1-8 | 243-245 | Delete the last sentence. It is unnecessary in this discussion on the concept of an analytical protocol. |
| C31 | 1.4.6 | 1-8 | 249-251 | Delete the second and third sentences of this paragraph, along with the first word ("However") of the fourth sentence. |
| C32 | 1.4.6 | 1-8 | 255-257 | Delete the last sentence of this paragraph. |
| C33 | 1.4.7 | 1-9 | 276 | Suggest <i>expanded uncertainty</i> |
| C34 | 1.4.7 | 1-9 | 279-289 | Here and elsewhere in the document, the word "uncertainty" is used to describe the inability of any procedure to measure some true value exactly. Sometimes, however, a decision depends on the variability of true values for a parameter, as with variable soil concentrations over a contaminated site. In that case, the important uncertainty may be about the true value of, say, the mean, and depends on the sampling strategy as well as the analytic procedure. From reading the whole Manual, I am sure the MARLAP team is well aware of the distinction between uncertainty and variability--and that variability in one parameter can lead to uncertainty about another. But perhaps it should reveal that understanding fairly early in the document, perhaps by directing the reader to a detailed discussion later, e.g., in Chapter 19. |
| C35 | 1.4.8 | 1-10 | 311 | The statement that "bias . . . does not vary" seems to me not quite right. If you find out that the butcher has his thumb on the scale, that would be bias, but the amount of the overage would not necessarily be the same from package to package. |
| C36 | 1.4.9 | 1-11 | 356 | I don't understand the distinction between "total uncertainty" (line 356) and "expanded uncertainty" (line 276). Are these synonymous? |
| C37 | 1.4.9 | 1-12 | 376-383 | In this paragraph, the same basic concept is repeated three times, reworded each time for a different emphasis or level of detail. This repetitiveness is distracting to the reader. |
| C38 | 1.4.10 | 1-13 | 403-408 | Could probably delete this paragraph because the focus is on the MARLAP process, not defining the concept of APSs. |
| C39 | 1.5 | 1-14 | 444-475 | It would make sense to move this section to precede Section 1.4. |

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| C40 | 1.6 | 1-15 | 477-493 | Summarize the first two paragraphs in just a couple sentences with minimal detail. More detailed information should only appear in the subsections. |
| C41 | 1.6 | 1-15 | 477-497 | Delete these three paragraphs; it's all covered (or should be) in subsections 1.6.1 and 1.6.2 |
| C42 | 1.6 | 1-15 | 477-576 | Section 1.6 needs a thorough edit to reduce its repetitious nature by streamlining the descriptions of Parts I and II, and using a consistent format and level of detail for the 3 subsections. Specific suggestions are made in separate comments. |
| C43 | 1.6 | 1-15 | 494-497 | I suggest deleting this paragraph and follow through by setting a goal of minimizing the extent to which information is repeated in detail throughout MARLAP. |
| C44 | 1.6 | 1-16 | Fig 1.3 | I like this figure as a roadmap to the chapters in Part I. However, it should also show key feedback loops |
| C45 | 1.6 | 1-16 | Fig 1.3 | The use of acronyms in Fig 1.3 is somewhat inconsistent. For example, in the top box, APSs is spelled out but MQOs is not. In the box for Chapter 5, shouldn't the acronym in parentheses be APSs instead of MQO? |
| C46 | 1.6.1 | 1-17 | 499 | It's a minor point, but I think Chapter 1 should be considered to be part of Part I (or is it Volume I?). |
| C47 | 1.6.1 | 1-17 | 499-527 | A more user-friendly format would be a short introductory paragraph, followed by bullets for each chapter, similar to the format used for Appendices A-C on lines 580-587 in section 1.6.3. Figure 1.3 should be cited early in this subsection. Otherwise, the second paragraph should be largely dropped, particularly lines 523-527; this subsection is not the place to be discussing details of MARLAP. |
| C48 | 1.6.2 | 1-17 | 529-576 | Edit to make this a more user-friendly presentation with minimal repetition of information (no need to state three times that Part II does not contain step-by-step instructions!). I suggest starting the section with a succinct introductory paragraph and using bullets to describe (in a sentence or two) the contents of each chapter in Part II. |
| C49 | 2.1 | 2-1 | 26 | Provide a more specific cross-reference here (Section 1.4.9 instead of to just Chapter 1). |
| C50 | 2.1 | 2-1 | 3-12 | This first paragraph should be briefer and allow lines 14-25 to expand on the objectives. Suggested edit: Keep lines 3-5, delete lines 6-9, and keep the italicized text in lines 9-12. |
| C51 | 2.1 | 2-1 | all | I like the overall format of this introductory section: a) a brief introductory paragraph that identifies the topic of the chapter and how it fits into the MARLAP process, b) an explicit but brief list of chapter objectives, c) comments about terminology used in the chapter, and d) a succinct overview of the chapter sections, with high-level cross-references if appropriate. |
| C52 | 2.5 | all | | I think that the discussion of the DQO process would be much clearer to the reader if Appendix B (sections B1 to B3.9) were incorporated in its entirety into chapter 2. As it now stands, neither Appendix B nor Chapter 2 give the total picture, and the different numbering of steps in these two parts of the Manual adds to the confusion. In many cases, the text in Appendix B tends to explain the process better than does Chapter 2. Specific suggestions for merging the two are provided as separate comments (see comments for sections 2.5.1, 2.5.2, 2.5.2.3, 2.5.2.4, 2.5.3, and 2.5.4). If there is some pressing reason that the two cannot be merged, then at a minimum there should be cross-references to appropriate sections of Appendix B sprinkled throughout Chapter 2 in order to tie the two together. Attachment B-1 to Appendix B also provides information that is important for understanding the underpinnings of a performance-based laboratory process; it may not need to be elevated to Chapter 3 status, but technically oriented readers should be encouraged to read it. |
| C53 | 2.1 | 2-2 | 42-48 | This last paragraph seems out of place for a chapter introduction. It should be deleted or moved to merge with the introductory paragraph for section 2.3.3. |
| C54 | 2.1 | 2-2 | 44-45 | I suggest deleting the name of the referenced section and the chapter in which it occurs. The section number alone is adequate. This should be a global change throughout the document (i.e., citing no more than the chapter or section number for a cross-reference). |
| C55 | 2.2 | 2-2 | 49-92 | Nicely written section, just the right level of detail, good pacing, effective mix of presentation styles (short paragraphs, |

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| | | | | bulleted lists, boxed example) |
| C56 | 2.2 | 2-3 | 71 | "licensees" seems to imply that the party with the financial liability would always be a licensed entity, which is probably not the case in a lot of cases. Suggest broadening term to include "responsible parties" and other words to include those non-governmental organizations with a financial interest. |
| C57 | 2.2 | 2-3 | 78-79 | The concept expressed in this first sentence should be included in the list of recommendations at the end of the chapter, e.g. "MARLAP recommends the collection of only those data needed to address the appropriate questions and support defensible decisions." |
| C58 | 2.3.1 | 2-4 | 104-105 | The concept expressed in this first sentence should be included in the list of recommendations at the end of the chapter, e.g. "MARLAP recommends a graded approach in which the sophistication, the level of QC and oversight, and the resources applied be appropriate to the project." |
| C59 | 2.3.3 | 2-6 | 160 | What is meant by the phrase, "the concern that requires streamlining"? |
| C60 | 2.3.3 | 2-6 | 173-176 | The concept expressed in this first sentence should be included in the list of recommendations at the end of the chapter, e.g. "MARLAP recommends the planning team strive for consensus among the stakeholders on the project planning elements." |
| C61 | 2.4 | 2-7 | 194-195 | The concept expressed in this second sentence should be included in the list of recommendations at the end of the chapter, e.g. "MARLAP recommends that the planning team consist of all of the parties who have a vested interest in, or who can influence, the outcome (stakeholders)." |
| C62 | 2.4.1 | 2-7 | 205 | Shouldn't the planning team also include representatives of the parties paying for the analyses and potentially for remedial actions afterwards? |
| C63 | 2.4.1 | 2-7 | 204 | At some place in this section, possibly even in the introductory sentence, mention that the graded approach applies to the team representation too, that the team might consist of just a couple people, extending up to a dozen or so, depending upon the magnitude of the problem and the complexity of the issues. |
| C64 | 2.4.1 | 2-8 | 194, 199 | The concept expressed in this sentence should be included in the list of recommendations at the end of the chapter, e.g. "MARLAP recommends that the planning team include operational and technical experts, including a radionalytical specialist." |
| C65 | 2.4.2 | 2-8 | 234 | At some place in this section, mention that the role of the "radioanalytical specialist" need not be filled by a single person with a specific title but rather may be jointly covered by the expertise and experience of the other team members, e.g., an industrial hygienist, lab personnel, scientist, project manager. |
| C66 | 2.5 | 2-9 | 253-542 | The process of developing DQOs as specific statements seems to fall through the cracks in that this task never gets discussed explicitly, but just implicitly. It would help a lot to have some DQO examples, similar to the example of a decision rule given in section 2.5.3 on page 2-15. |
| C67 | 2.5 | 2-10 | 284-289 | The concept expressed in these sentences should be included in the list of recommendations at the end of the chapter, e.g. "MARLAP recommends that the planning team ensure that it conducts the planning process in an iterative, rather than stepwise, fashion, with the objectives of more precisely defining the decisions and data needs as the planning progresses, and using new information to modify or change earlier decisions until the team has determined the most resource-effective approach to the problem." |
| C68 | 2.5 | 2-10 | Table 2.1 | I really like this table's design and content as an effective summary of the planning process and the role of the radioanalytical specialist. Consider whether it might be appropriate to include in an Executive Summary. |
| C69 | 2.5 | 2-10 | Table 2.1 | Row 1, Column 1: replace "State the problem" with "Define the problem" in order to match the title of section 2.5.1 |
| C70 | 2.5 | 2-10 | Table 2.1 | Use a consistent format for the column entries--in Row 1, Column 4, reword bullets, e.g., "Problem defined with |

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| | | | | specificity," and "Identification of the..." |
| C71 | 2.5 | 2-11 | Table 2.1 | Row 2a, Column 3, bullet 3, lines 2-3: Replace "Analytical Protocol Specifications" with "APs"; the use of acronyms throughout this table is inconsistent (i.e., sometimes used, sometimes not) |
| C72 | 2.5 | 2-11 | Table 2.1 | Row 2b, Column 3, bullet 2: Is "alternate" the right word? Should it be "alternative," "additional", or "surrogate"? |
| C73 | 2.5 | 2-11 | Table 2.1 | Row 2c, Column 4, bullet 2: the meaning of "scale" here is not clear. How is the meaning of this bullet different from the one above it? |
| C74 | 2.5 | 2-11 | Table 2.1 | Row 3a, Column 1, bullet 3: The meaning of this bullet is not clear ("the scale of decision making"). Perhaps better to replace "scale" with "extent"? |
| C75 | 2.5 | 2-12 | 342-542 | Although I have lots of questions and suggested changes to these subsections, nevertheless I find them to be useful and to add value beyond the information presented in Table 2.1. The text doesn't duplicate the table entries but the two discussions support one another. The main inconsistency is that individual items in the subsections are sometimes discussed under different elements than where they appear in Table 2.1, as pointed out in some of my specific comments on these subsections. |
| C76 | 2.5 | 2-12 | Table 2.1 | Need to indicate which element(s) result in DQOs as the output. As it is now, DQOs are not mentioned in this table until the last column of the last element, so that they appear to spring from nowhere. |
| C77 | 2.5.1 | 2-12 | | Merge Appendix section B3.1 with section 2.5.1 |
| C78 | 2.5.2 | 2-13 | 364 ff, esp 376 ff | Perhaps it should be clearer that not all radiochemical analyses are undertaken with a specific decision in mind, let alone a unique action level that will drive the decision. MARLAP works better if there is, but it has much to contribute even if there isn't, as when some general characterization work is undertaken. This issue is briefly discussed on p. 7-24, lines 694 ff; a cross-reference could be added here. |
| C79 | 2.5.2 | 2-13 | 369 | "operation" is somewhat confusing here as a phase of site closure. Perhaps replace it with "cleanup operation" |
| C80 | 2.5.2.1 | 2-13 | 375 | Here, actions levels are discussed under "Identify the Decision." However, in Table 2.1, action levels are assigned to Row 2b, "Identify inputs to the decision," which is section 2.5.2.3 in the text. |
| C81 | 2.5.2 | 2-13 | | Merge Appendix section B3.2 with section 2.5.2 |
| C82 | 2.5.2.1 | 2-14 | 392 | The logic of this sentence is not quite clear as written because the information in the parentheses is not an example of reasons that the no action alternative is overlooked. Reword this line by inserting connecting words: "overlooked but may be the optimal course of action (e.g, no technology...)" |
| C83 | 2.5.2.2 | 2-14 | 401 | Replace "Scale" with "Boundaries" to match entry in Row 2c of Table 2.1 |
| C84 | 2.5.2.2 | 2-14 | 410-415 | The topic of this paragraph and the level of detail in it seem inappropriate for this overview discussion. I suggest that it be deleted. |
| C85 | 2.5.2.3 | 2-15 | 416 | Delete "and Boundaries" to match entry in Row 2b of Table 2.1. Note that 2.5.2.2 and 2.5.2.3 are reversed from the order in which these elements appear in Table 2.1 |
| C86 | 2.5.2.3 | 2-15 | 416-423 | The distinction between the discussions in sections 2.5.2.2 and 2.5.2.3 is blurry; these subsections overlap with one another. |
| C87 | 2.5.2.3 | 2-15 | 418 | To give another common example of a statistical parameter, insert "95th percentile concentration" after "mean" |
| C88 | 2.5.2.3 | 2-15 | 419-422 | Delete the first sentence ("Typically, the study boundaries...") because this topic was discussed in section 2.5.2.2. Move the second sentence ("Changing conditions...") to section 2.5.2.2. |
| C89 | 2.5.2.3 | 2-15 | 423 | Discussion of the "appropriate action level" here blurs the distinction between the discussions in sections 2.5.2.1 and 2.5.2.3 because action level was discussed extensively in section 2.5.2.1. |
| C90 | 2.5.2.4 | 2-15 | 426 | Explain why an estimate of the expected variability is needed. E.g., "because the uncertainty estimate is used to define the |

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| | | | | gray region and factors into the determination of decision error rates." |
| C91 | 2.5.3 | 2-15 | 438 | Should a third item be added to the list of what is included in the decision rule? "(3) the decision that would be made, or the action that would be taken, based on the different possible outcomes of the analytical data." |
| C92 | 2.5.3 | 2-15 | 439 | I very much appreciate the inclusion of an example at this point in the discussion, and suggest that a couple other examples of decision rules be given in this same box for other common situations, e.g., using drinking water standards and waste disposal path determination. |
| C93 | 2.5.3 | 2-15 | 442 | Is the word "technical" appropriate here, or should it be deleted? Same comment for its use in line 444. I don't understand its purpose in this context. Perhaps you mean "alternative measurement approaches or protocols", which is used on line 462? |
| C94 | 2.5.2.4 | 2-15 | | Create new section about a feedback loop at this point by moving Appendix Section B3.5 to chapter 2, either creating new 2.5.2.5 or renaming as new 2.5.3 |
| C95 | 2.5.2.3 | 2-15 | | Merge Appendix section B3.3 and B3.4 with section 2.5.2.3 (or split 2.5.2.3 into two sections, 2.5.2.3 and new 2.5.2.4) |
| C96 | 2.5.3 | 2-15 | | Merge Appendix section B3.6 and B3.7 with section 2.5.3 (or split 2.5.3 into two sections) |
| C97 | 2.5.3 | 2-16 | 445 | Insert after "radionuclide of interest": "with sufficient confidence at the action level" |
| C98 | 2.5.3 | 2-16 | 466-468 | I don't understand the intent of the word "attempts" here. In fact, the first and last halves of this sentence don't make sense together. Is some text missing? |
| C99 | 2.5.4 | 2-17 | 474 | Replace the last part of the sentence so that it reads "between the radioanalytical specialist and laboratory and field personnel." |
| C100 | 2.5.4 | 2-17 | 475-482 | This would be a good place to point out that it may be more important and useful to obtain lots of data of only modest quality (e.g., $\pm 30\%$) rather than few samples of very high quality (e.g., $\pm 1\%$). For example, screening for hot spots, collecting reconnaissance data from an area about which little is known, collecting water samples for radon analyses under conditions for which where it is known or suspected that the sample may outgas highly, collecting data for a purpose for which a precise method not needed, and when field sampling uncertainties may overwhelm analytical uncertainties. (Same comment for 2:534-539, 3:107-121, 6:156-168, B:347-554, and C:140-146.) |
| C101 | 2.5.4 | 2-17 | 475 | Is the "analysis design" the same as the "data collection design" on line 473? If so, then a single term should be used. |
| C102 | 2.5.4 | 2-17 | 483-498 | The rest of section 2.5.4 does not follow an obvious logical progression, in terms of topics and level of discussion. The boundaries between the first two paragraphs (lines 483-498) and sections 2.5.4.1 and 2.5.4.2 are fuzzy. I suggest that the details discussed in these two paragraphs (e.g., starting with line 487) be moved into the subsections. |
| C103 | 2.5.4 | 2-17 | | Merge Appendix section B3.8 with section 2.5.4 |
| C104 | 2.5.4.2 | 2-18 | 527 | I don't understand what is meant by "collocated sample precision" |
| C105 | 2.5.4.2 | 2-18 | 534-539 | Same comment as for section 2.5.4, lines 475-482. This is a good place to point out that it may be more important and useful to obtain lots of data of only modest quality (e.g., $\pm 30\%$) rather than few samples of very high quality (e.g., $\pm 1\%$). For example, screening for hot spots, collecting reconnaissance data from an area about which little is known, collecting water samples for radon analyses under conditions for which where it is known or suspected that the sample may outgas highly, collecting data for a purpose for which a precise method not needed, and when field sampling uncertainties may overwhelm analytical uncertainties. |
| C106 | 2.5.4.2 | 2-19 | 539 | Should "decisions" be "criteria"? |
| C107 | 2.6.2 | 2-21 | 601 | I recommend starting this paragraph with a simple definition of what chain of custody means. |
| C108 | 2.6.2 | 2-21 | 604-605 | Delete this sentence about the data report; the contents of the data report are irrelevant to the discussion of the COC. Also, the phrase "not all of which can be listed here" is confusing and ambiguous because this paragraph doesn't list anything |

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| | | | | nor does it tell you whether this information is listed elsewhere in the manual or not at all in the Manual. |
| C109 | 2.6.2 | 2-21 | 605 | The use of "component" here is confusing. Replace with "personnel"? |
| C110 | 2.7.1 | 2-21 | 624-627 | The concept expressed in this sentence should be included in the list of recommendations at the end of the chapter, e.g. "MARLAP recommends the use of a formal change control process if updates of the original plans are found to be needed in response to new information on field conditions or other situations." |
| C111 | 2.7.1 | 2-22 | 636 | The meaning of this bullet is not completely clear. Perhaps reword the last part: "for evaluating the usability of the data"? |
| C112 | 2.7.2 | 2-22 | 658-659 | The concept expressed in this sentence should be included in the list of recommendations at the end of the chapter, e.g. "MARLAP recommends that a Statement of Work be developed even if a contract is not involved, for example, when an agency employs one of its own laboratories." |
| C113 | 2.7.4 | 2-23 | 693 | What does "it" refer to? Perhaps reword the second half of this sentence as: "while DQA considers the data set as a whole, including the sampling and analytical protocols used to produce them, during the assessment of data quality" |
| C114 | 2.7.4.1 | 2-24 | 704 | Clarify parenthetical note by expanding it: "(as prescribed by the MQOs)" |
| C115 | 2.7.4.2 | 2-24 | 716 | Reword last part: "...MQOs as the basis for assessing whether the obtained data..." |
| C116 | End | 2-25 | 728-733 | This list of succinct recommendations is a great idea and should also make it easier to develop an Executive Summary. Consider making this list a separate section and expanding it to be more inclusive of other key points in this chapter (as suggested in separate comments). Also I think it would be less distracting if the phrase "MARLAP recommends" were not used to introduce every recommendation, but instead was used as the introductory sentence to this compilation, e.g., "MARLAP recommends the following actions during the planning phase when a decision is to be based on the collection and evaluation of radiological data:" |
| C117 | End | 2-25 | 729 | I suggest that this recommendation be expanded to contain a bit more information, e.g., "directed project planning process in order to provide logic and framework for defining the data needed to support an informed decision for the project." |
| C118 | End | 2-25 | 730-731 | I suggest rewriting this recommendation to be more general: "MARLAP recommends that technical experts, and particularly radioanalytical specialists, be a part of a multi-disciplinary project planning team that includes other stakeholders as well." |
| C119 | End | 2-25 | 732-733 | I suggest separating this recommendation into two: (1) "MARLAP recommends that the planning process rationale be documented in project plan documents." and (2) "MARLAP recommends that the outputs from the planning process be integrated with the analytical SOW and data assessment plans (e.g., for data validation, verification and quality assessment)." |
| C120 | 2.8 | 2-25 | 752 | Couldn't get to the web site using this address. Replace "/filesfin.htm" with "/obtain.htm" |
| C121 | 2.8 | 2-26 | 765-766 | I don't remember coming across a citation to this reference in this chapter, although I would have expected to see it cited in section 2.7.4.1 |
| C122 | 2 | All | | Where can you find a radioanalytical specialist? I think that they are absolutely essential throughout planning, implementation, and assessment. But the skill set for a radioanalytical specialist is different than for the generic "radiation physicist" that we have in our job specs. I wonder if it would be useful for small licensees or small regulatory programs to have a job spec or a SOW to hire a radioanalytical specialist to help with writing the real SOW for the project, evaluation of bids, and assessment of the data. |
| C123 | 2.2 | 2-2 | | This section and others seem to suggest that radiological laboratory analytical data are only required to help solve problems or to conduct projects. The ongoing activities that utilize these data such as effluent monitoring and environmental surveillance activities at all of the major nuclear power, production and research sites should also be recognized as consumers of radiological laboratory analytical data . |

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| C124 | 2.3.1 | 2-4 | 103-109 | The limited number of references to a "graded approach" (e.g., p. 2-4, lines 103-109, Section 4.5.3, and the first recommendation on p. 4-18) do not provide guidance that is clear or complete about when to do what. |
| C125 | 3.1 | 3-1 | 20-23 | Could make this paragraph more succinct with no loss of relevant information by the following changes. Replace lines 21-23 to read as follows: "this chapter provides a list of some common key analytical issues as well as a framework and broad base of information..." |
| C126 | 3.2 | 3-2 | 40 | Replace "The analytical process as described in Chapter 1 includes all activities, starting with" with "The analytical process, as defined in Section 1.4.4 and illustrated in Figure 3.1, starts with" |
| C127 | 3.3 | 3-2 | 57 | Reword this reference: "discusses how some of these planning issues influence the method selection process" |
| C128 | 3.3.1 | 3-4 | 75 | This section defines the target analyte list in terms of radionuclides. The statement should be broadened to include chemical contaminants as well since the planning issues are applicable to the whole spectrum of constituents of concern. |
| C129 | 3.3.1 | 3-4 | 73-74 | Delete "that should be addressed...planning team" |
| C130 | 3.3.1 | 3-4 | 75 | Insert a new sentence as a note? "(Note that the target analyte list may also include nonradioactive hazardous constituents, which could also influence the analytical protocols, including sample collection and waste disposal issues. However, although this issue would probably be dealt with by the same planning team, discussion of it is outside the scope of MARLAP.)" |
| C131 | 3.3.1 | 3-5 | 102 ff | This paragraph should note that under certain circumstances, a properly designed characterization survey can be used as the final status survey for areas found to be unimpacted or at contaminant concentration levels well below the DCGLs. |
| C132 | 3.3.1 | 3-5 | 102-106 | Shorten the first three sentences to two sentences by re-ordering them. Start off with "A fourth source of information...study." The next sentence would then read, "This preliminary analysis may be necessary if there are little or no historical data..inadequate quality." |
| C133 | 3.3.1 | 3-5 | 107-121 | Same comment as for section 2.5.4, lines 475-482. This is a good place to point out that it may be more important and useful to obtain lots of data of only modest quality (e.g., $\pm 30\%$) rather than few samples of very high quality (e.g., $\pm 1\%$). For example, screening for hot spots, collecting reconnaissance data from an area about which little is known, collecting water samples for radon analyses under conditions for which where it is known or suspected that the sample may outgas highly, collecting data for a purpose for which a precise method not needed, and when field sampling uncertainties may overwhelm analytical uncertainties. |
| C134 | 3.3.1 | 3-5 | 122 | I appreciate the explicit description of the output from this discussion. |
| C135 | 3.3.2 | 3-6 | 132-133 | It would be less distracting to the reader if the phrase "concentration range for each analyte" was shortened to "range", and if the phrase "fairly large concentration range for the radionuclide of concern" were shortened to "fairly large range". No ambiguity would result because the introductory sentence makes it clear what range is being discussed. |
| C136 | 3.3.2 | 3-6 | 135-136 | The following would read more smoothly: "for the protocol selection process, thereby eliminating any analytical protocols that cannot accommodate this need." |
| C137 | 3.3.2 | 3-6 | 136-141 | Write these sentences more succinctly as follows: "In addition, knowledge of the expected concentration ranges for all of the radionuclides of concern can be used to identify possible chemical or spectral interferences that might lead to the elimination of some of the alternative analytical protocols." |
| C138 | 3.3.3 | 3-6 | 147 | Insert after "air particulates": "radioactive gases" [referring to radon, tritium, iodine] |
| C139 | 3.3.3 | 3-7 | 160-161 | Shorten the last part of this sentence to read, "information on their chemical and physical characteristics and on possible hazards associated with them." |
| C140 | 3.3.4 | 3-7 | 165 | Because there could be more than two radionuclides of concern, replace "Between" with "Among" in this section title. Consider replacing "Relationship" with "Correlation" here and throughout this section. |

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| C141 | 3.3.4 | 3-7 | 166 | Would "surrogate" or "indicator" be a more appropriate word than "alternative"? The term "surrogate" implies that the radionuclide to be measured is a substitute for the radionuclide of interest, although the measured radionuclide is not itself particularly of interest or concern. In contrast, the term "alternative" implies a choice among radionuclides of equal interest or concern. |
| C142 | 3.3.4 | 3-7 | 188-189 | Same question as for line 166: Would "surrogate" or "indicator" be a more appropriate word than "alternative"? |
| C143 | 3.3.6 | 3-8 | 228 | Provide cross-reference to sections 2.5 or 2.6 for discussing DQOs as an output |
| C144 | 3.3.7 | 3-9 | 240 | A paragraph defining the "gray region" here would be helpful for readers who are not familiar with MARSSIM (or have short memories). The single statement in this paragraph and the references to the appendices are not really sufficient to allow the reader to understand the MQOs. |
| C145 | 3.3.7 | 3-9 | 243 | Suggest inserting "relatively" before "high decision error rate". If the LBGR allows a 5% type II error, is 6% really "high"? |
| C146 | 3.3.7 | 3-11 | 291-294 | Delete this paragraph. |
| C147 | 3.3.7.1 | 3-11 | 295-442 | A lot of the same material is covered in section 6.5.5, but there are no cross-references between the two to link them together. Rather than treating the topic in full in both sections, the verbiage and overlap should be minimized by one of three approaches: (1) merge Sections 3.3.7.1 and 6.5.5 together in one chapter, (2) provide the bulk of the discussion in one chapter, with a highly summarized version in the other, with cross-references to the fuller discussion, or (3) establish a clear distinction between the scope and audience of each section, winnow out the parts that are not relevant for the particular chapter, and insert cross-references into both versions where appropriate. |
| C148 | 3.3.7.1 | 3-12 | 328 | Following the symbol del, insert "and is a function of the action level, background level, and adopted decision error rates" |
| C149 | 3.3.7.1 | 3-12 | 328 | Replace reference to "Appendix B" with "Appendix Attachment B-1" |
| C150 | 3.3.7.1 | 3-13 | 374 | Footnote 1: what does it mean in English? Provide a cross-reference. |
| C151 | 3.3.7.1 | 3-13 | Footnote | Footnote 1: Don't think beta has been defined near this point. |
| C152 | 3.3.7.1 | 3-14 | 385 | How near to zero should the LBGR be? Suggest you delete "or near" unless you define "near". |
| C153 | 3.3.7.1 | 3-14 | 395-396 | Delete "this method performance characteristic..important method parameter. And last..." |
| C154 | 3.3.7.1 | 3-14 | 399-402 | These two sentences are so similar in wording that it takes a couple readings to note the differences. I suggest making the distinction more clear by rewording it as follows: "MQOs for each analyte: (a) expressed as MQCs if the lower bound of the gray region is at or near zero and decisions are to be made about a sample population; and (b) expressed as MDCs if the lower bound of the gray region is zero, and decisions are to be made about individual items or samples." Note the reworded version is also stated as an item, not in sentence form, to match the format of the other output statements in this section. |
| C155 | 3.3.7.1 | 3-15 | 421-425 | This sentence would read more smoothly by rewording it: "The importance of this characteristic is evaluated by the radioanalytical specialist, based upon information about the expected concentration range of the analytes of concern as well as other chemical constituents that may be present and the chemical and physical characteristics of the matrices (sections 3.3.2 and 3.3.3)." |
| C156 | 3.3.7.1 | 3-15 | 434-438 | This sentence would read more smoothly by rewording it: "The importance of this characteristic is evaluated by the radioanalytical specialist, based upon detailed information about the chemical and physical characteristics of the sample. If important, then an MQO should be developed for it, and may require performance data demonstrating..." |
| C157 | 3.3.7.3 | 3-16 | 460 | Does this mean that a result of 0.02 +/- 0.02 would be rejected as not meeting the MQO, even though it is below the action level with a high degree of certainty? |
| C158 | 3.3.7.3 | 3-16 | 466 | I don't think that "coverage factor" has been defined yet at this point, at least not in chapter 3. Provide cross-reference. |

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| C159 | 3.3.7.3 | 3-17 | 476 | The example did not make sense to me. It's confusing and needs to be reviewed to make sure it accurately states the problem and the answer. |
| C160 | 3.3.7.3 | 3-17 | 487 | I think 1.50 Bq/g is a typo, and that it should be "0.150 Bq/g" to agree with line 479 |
| C161 | 3.3.8 | 3-17 | 496 | Can you give an example of how the specification of analyses to be performed could limit the analysis options for the lab, if this constraint does not mean that a specific protocol or method has to be used? If I am understanding correctly, an example would be the following: "The analyte of concern is total uranium, but the team decides that a gross alpha measurement would be an acceptable alternate analysis and therefore specifies that analysis." But the text on lines 498-501 seems to say this example is not right either. So I'm lost here. |
| C162 | 3.3.8 | 3-18 | 501-504 | Shorten this discussion after "239Pu in soil, etc." by replacing it with the following: "The project planning team may decide to eliminate some analyses from consideration based on information obtained, such as the absence of..." |
| C163 | 3.3.8 | 3-18 | 508 | Should "analyses" be replaced by "methods" here? If not, then I'm still lost as to the distinction between these two terms. |
| C164 | 3.3.8.1 | 3-18 | 523-557 | Delete sections 3.3.8.1 to 3.3.8.3, and direct the reader back to 3.3.1 (lines 111-121) and/or to appropriate sections of Part II. |
| C165 | 3.3.9 | 3-19 | 560 | Replace "determined" with "specified" and insert adjective "along with the associated sample matrices" |
| C166 | 3.3.9 | 3-20 | 568 | Insert new beginning to this sentence, as follow: "Assuming that a method is not prescribed by the applicable regulations, then there are a number of sources...." |
| C167 | 3.4 | 3-22 | 646-653 | Replace these 8 lines with the following: "...types of projects, as summarized in Table 3.1." Everything else is either extraneous, repetitious, self-evident from the table, or duplicates text in the subsections. |
| C168 | 3.4 | 3-23 | 667-668 | Replace beginning of sentence: "Some solid samples may require preservation..to prevent sample degradation or loss of water and other volatiles." This is true for some soils and sediments as well as for biota. |
| C169 | 3.4 | 3-23 | 673-679 | Delete these cross-references here, and put them in Table 3.1, Column 3. For example, list the first couple potential key issues in this column as: "Container type and material (Chapter 10); Sample preservation (Chapter 10)", etc. |
| C170 | 3.4 | 3-23 | Table 3.1 | Row for liquids, column 2. Replace last item with "Order in which sample is filtered and preserved" |
| C171 | 3.4.1.2 | 3-24 | 691 ff | See comment for page 10-30, line 950 ff, about removing vegetative matter from soil samples |
| C172 | 3.4.1.2 | 3-24 | 700-701 | The sentence would read more smoothly as follows: "For soil samples, extraneous material to be removed, weighed, and then stored at the laboratory could include rocks of a certain sieve size, plant matter, debris, etc." |
| C173 | 3.4.2 | 3-25 | 708-719 | Here is a place where another cross-reference could be added. The team talks later (I don't remember where) about the difference in filtration requirements between raw and finished water sampling. |
| C174 | 3.4.2 | 3-25 | 710 | The relevance of section 3.3.3 is not obvious and perhaps this cross-reference should be dropped. |
| C175 | 3.4.3 | 3-26 | 743 | Insert phrase in middle of sentence: "...dissolve, break, or tear during sample collection or processing, thus invalidating the sample." |
| C176 | 3.4.3 | 3-26 | 747-750 | Pore size is not the only determinant of filter collection properties. Collection of very small particles occurs mostly by diffusion and particle sizes much smaller than the pore size will be collected with high efficiency on filters. |
| C177 | 3.5 | 3-27 | 769-771 | The concept expressed in this sentence should be included in the list of recommendations at the end of the chapter, e.g. "MARLAP recommends that the level of specificity in the APSs be limited to those requirements that are considered essential to meeting the project's analytical data needs." |
| C178 | 3.5 | 3-28 | 807-810 | Replace the four entries under "Type" with the following: "Method blank (Section 3.3.10), Duplicate (Section 3.3.10), Matrix spike (Section 3.3.10), and Laboratory control sample (Section 3.3.10)" |
| C179 | 3.5 | 3-28 | 813-821 | Check all the cross-references under the column labelled "Special Requirements" |
| C180 | 3.5 | 3-29 | 831 | Figure 3.3: Should the lab know what the action level is? Might they analyze or report differently depending on the value, |

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| | | | | instead of just following an approved procedure? Whatever the answer, it could be discussed nearby this Figure. |
| C181 | 3.7 | 3-30 | 864 | Add to end of this line "and matrix combination" |
| C182 | 3.7 | 3-30 | 869-870 | Reword this recommendation as follows: "MARLAP suggests that the MQO for the detection capability for a given analyte/matrix combination be expressed as a minimum detectable concentration (MDCs) if the lower bound of the gray region is zero and decisions are to be made about individual items or samples." |
| C183 | 3.7 | 3-30 | 871-872 | Reword this recommendation as follows: "MARLAP suggests that the MQO for the detection capability for a given analyte/matrix combination be expressed as a minimum quantifiable concentration (MQC) if the lower bound of the gray region is at or near zero and decisions are to be made about a sample population." |
| C184 | 3.8 | 3-31 | 887 | Couldn't get to the web site using this address. Replace "/filesfin.htm" with "/obtain.htm" |
| C185 | 3.3 | All | 122 ff | The clear inclusion of an "Output" statement at the end of the discussion of each Analytical Planning Issue is very helpful in understanding the value (importance) of each item discussed (pp 3-2 to 3-22) |
| C186 | 3.4 | 3-23 | Table 3.1 | The text seems to be quite repetitive of the information given in Table 3.1 without giving any added value. The authors or technical editor should consider deleting one or the other. |
| C187 | 4.5.3, 4.6.1 | 4-11 | 306 ff | Table 4.2 seems to be in an awkward place in the text. In its current location, it is referred to in Section 4.5.3., which contains text relating to small projects. One must page over quite a bit to find the other, primary reference to this table in Section 4.6.1. Could the text before the table be revised to indicate that this table applies in some way to both small and large projects? |
| C188 | 4.5.1 | 4-7 | 193 ff | Table 4.1 needs a better caption to describe the purpose of the table more clearly. Perhaps it could read something like "Comparison of contents in different plan documents." |
| C189 | 5.3.5 | 5-4 | 134 ff | I wondered when QC samples should be blind to the analyst. Chapter 18 and Appendix C do discuss this issue to some extent, but maybe a specific cross-reference is needed here. |
| C190 | 5 | All | | On a practical problem, there is no guidance for "what do you do if no one bids on your project?" For small projects, it might not be very lucrative, so labs might not bid. What do you do? |
| C191 | 5.4.3.3 | 5-11 | 376-378 | Timely reviews of the data packages is a very important point. This cannot be emphasized enough. Without feedback from this review process, the whole process could suffer because needed changes would not be identified in a timely or effective manner. |
| C192 | 5.3.3 | 5-3 | 110-111 | The suggested statement "A method uncertainty of 0.5 Bq/g is required at the action level of 5.0 Bq/g" seems curious as written. Shouldn't the emphasis be on keeping the uncertainty to less than or equal to 0.5 Bq/g? As written, it sounds like the uncertainty is required to equal a particular value. |
| C193 | 6.4 | 6-11 | 156-168 | Same comment as for section 2.5.4, lines 475-482. This is a good place to point out that it may be more important and useful to obtain lots of data of only modest quality (e.g., $\pm 30\%$) rather than few samples of very high quality (e.g., $\pm 1\%$). For example, screening for hot spots, collecting reconnaissance data from an area about which little is known, collecting water samples for radon analyses under conditions for which where it is known or suspected that the sample may outgas highly, collecting data for a purpose for which a precise method not needed, and when field sampling uncertainties may overwhelm analytical uncertainties. |
| C194 | 6.4 | 6-11 | 159 | How would one define the value of the "screening level"? I can't remember whether this issue is covered elsewhere. |
| C195 | 6.4 | 6-11 | 185 | "Robustness" is used here, whereas "ruggedness" seems to be preferred elsewhere. If there is a difference, it should be explained. Also p. 6-14, line 257 |
| C196 | 6.5.1 | 6-13 | 236 ff | This section seems to be addressed to the laboratory rather than to the project planners, which is unique. Probably not a key problem, but disconcerting to me. |

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| C197 | 6.6.2 | 6-28 | 727 ff | Table 6.1: The basis for the numbers (e.g., "Three to five groups of two samples with concentrations within 20% of each other" or 3 concentrations levels with 7 replicates) was not clear to me. They are probably reasonable, but I'd like to know how they were established. |
| C198 | 7.1 | 7-1 | 25 | The phrase "...final evaluation of the protocol's performance..." should be re-written. The protocol doesn't do anything. The laboratory uses the protocol in its performance. |
| C199 | 7.2.2.3 | 7-8 | 226 | For biological samples, cooling or freezing may be a better method of preservation than adding biological preservatives, which is suggested here. |
| C200 | 7.4.1.1 | 7-24 | 704 | Equation 7.3 is supposed to hold at the UBGR. Is this true even if the action level is not at the UBGR? |
| C201 | 8.2.2.3 | 8-4 | 124 ff | also raised the same question in my mind (cf comment for pg 5-4, line 134 ff, about when samples should be blind to the analyst) |
| C202 | 8.2.3 | 8-5 | 136-137 | Regarding combination of the verification and validation steps, it is stated here that "...they may be combined - with the verification activities constituting the bulk of the review." It is not clear why this should be the case; as described in section 8.5, validation does not appear to require significantly less effort than verification. |
| C203 | 8.2.3 | 8-6 | | Suggest that the data quality assessment portion of this flow chart (Figure 8.1) indicate that the verification and validation reports be reviewed as a part of data quality assessment phase. |
| C204 | 8.3 | 8-7 | 192 ff | This section is devoted to the validation plan. It invites the question as to whether or not there should be a verification plan and a section devoted to it. |
| C205 | 8.5 | 8-13 | 341 ff | I found the format used here, that spelled out verification and validation points very clearly, made the concepts easy to follow and understand. |
| C206 | 9.2 | 9-2 | 32 ff | How one selects the data verifiers, validators, and assessors should be discussed here. Can some of them come from the performing laboratory? From the sponsoring organization (e.g., EPA, DOE, NRC, or the Armed Forces)? From the financially responsible parties? From an outside organization contracted to do it? What qualifications are essential? |
| C207 | 9.6.4.1 | 9-24 | 645-651 | Should call to Figure 18.1 as an example |
| C208 | 10.1.2 | 10-3 | 71 | Suggest: " <i>Sample packaging, radiological surveys, shipping, and tracking; and...</i> " |
| C209 | 10.2.3.1 | 10-4 | 115-123 | This section on containers should cross-reference section 10.3.3.1, which although titled " <i>Sample Acidification</i> " also discusses relationships among sample containers, analytes and preservation, e.g., lines 699 to 719 in chapter 10. |
| C210 | 10.2.4 | 10-6 | 173-176 | <i>"The project manager needs to determine if a sample number scheme may introduce bias into the analysis process. That is, the lab may be aware of trends or locations from the sample identification and this could influence their judgment as to the anticipated result and thereby introduce actions on the part of lab personnel that they would not otherwise take."</i> [This recommendation is short-sighted and implies that labs are not trustworthy. In particular, labs need to be aware of "hot" samples because they may use separate areas and or labware for processing. In fact in section 12.2.2, lines 146-148, it is suggested that knowledge of historical or field screening data is useful to labs in preventing cross-contamination. In section 12.2.4, lines 313-314 it is stated that: " <i>Operations should be segregated according to activity level. Separate equipment and facilities should be used for elevated and low-level samples whenever possible.</i> "] |
| C211 | 10.2.5 | 10-8 | 217-219 | The time to date of analysis is usually captured in pre-established holding times, not left to the judgement of field sampling personnel who make the log or data form entries. |
| C212 | 10.2.7 | 10-9 | | We have found it useful to include a section on the chain of custody document indicating a radiation survey of the package, especially when no shipping manifest will be used (e.g., samples hand delivered to lab). |
| C213 | 10.2.11 | 10-13 | 369 | Suggest adding the following sentence: " <i>In almost every case, field sampling personnel will be subject to State or Federal occupational safety regulations. A few of the hazards peculiar to field sampling are discussed in the following sections,</i> |

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| | | | | <i>but these should not be considered to be the basis of a comprehensive occupational health and safety program."</i> |
| C214 | 10.2.11.1 | 10-13 | 378 | add text: At a minimum, drilling rig workers should... |
| C215 | 10.2.11.1 | 10-13 | 382 | Special safety precautions may also required when field personnel have to enter trenches to take samples. |
| C216 | 10.2.11.1 | 10-14 | 408 | A paragraph on the hazards of ultraviolet radiation should be added along with the heat stress. |
| C217 | 10.2.11.2 | 10-15 | 461 | Citation to "Department of Energy (1994)" should include a, b, c, or, d as there are four DOE (1984) references in the reference section. |
| C218 | 10.2.11.2 | 10-16 | 469 | Film badges and TLDs are not the only personnel dosimeters available. The Luxel dosimeter from Landauer appears to be a good alternative. According to company's web site (http://www.landauerinc.com/prsr/products/luxelosl.htm), this dosimeter is based on optically stimulated luminescence (OSL) technology, in which the aluminum oxide detector can be restimulated numerous times to confirm the accuracy of a radiation dose. The minimal reporting level is as low as 1 mrem, with a precision of +/- 1 mrem. |
| C219 | 30.3.2.1 | 10-20 | 631 | higher than what? |
| C220 | 10.3.2.2 | 10-21 | 660-661 | "...radionuclides that are highly insoluble, such as isotopes of uranium, thorium, and plutonium..." This is an invalid premise. Uranium is somewhat soluble and occurs dissolved in some groundwaters. Thorium and plutonium are better described as relatively immobile in the environment rather than insoluble, because thorium nitrate, for example, is certainly soluble. |
| C221 | 10.3.3.1 | 10-22 | | Somewhere in this section, or referenced from this section, it would be useful to have a table in which the known problems related to container and type of acid for the various radionuclides, matrices, and analytical methods are addressed. USGS documents usually indicate HCl rather nitric acid as a preservative for water. Is there a good reason for this? Another possibility would be to address these sampling concerns in section 14.10.9. |
| C222 | 10.3.3.2 | 10-24 | 766 | The statement "...paper pulp has been shown to remove more than 95 percent of radionuclides from solution..." seems too general. Tritium, for example, would not likely be removed by paper pulp. |
| C223 | 10.3.4.1 | 10-26 | 825-826 | What is a "...universal adapter and fill-line..." |
| C224 | 10.3.5 | 10-27 | 839 | The following sentence is much too simplistic as guidance for selecting milk sampling sites: " <i>Raw milk should be obtained from the closest cows or goats downwind from a source.</i> " For example, background sites should also be selected, and processed milk may have to be collected to fully characterize the impact on the general public. Significant iodine releases are much more likely to result from accidental exposures, which may be short term, than from continuous routine releases. Relying on a single "downwind" sampling location could potentially result in underestimating the impact of an episodic event. |
| C225 | 10.3.4.1 | 10-27 | 841 | Although mentioned in Table 10.1, adding formaldehyde to milk samples may require the samples, once analyzed, to be disposed of as chemical hazardous waste. This should be emphasized in the text as well as being mentioned in the table. |
| C226 | 10.3.4.1 | 10-27 | 844-847 | The recommendation to add NaI to milk samples should be limited to those samples destined for analyses involving radiochemical separation of iodine. Most milk samples for iodine analyses are analyzed by simple gamma-ray spectroscopy of the milk. |
| C227 | 10.4 | 10-29 | | Sampling a soil profiles and sediment cores for measuring total inventory is an important technique and is not present. Remove soil at certain depths and do an integrated curve. And plot activity vs. depth (c.f., EML manual). |
| C228 | 10.4.1.1 | 10-30 | 950 ff | This section talks about the possible need to remove vegetative matter, rocks, and debris from soil samples before analysis. It could be clearer that the lab needs to document the weight and nature of the material removed, because the average concentration in that fraction could well be different, often lower, than in the fraction analyzed. Whether the measured concentration needs to be adjusted before comparison with an action level depends on the exposure scenario that |

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| | | | | led to the action level. For example, if exposure via soil ingestion is the dominant route, then the concentration in the fine fraction is appropriate and no adjustment is needed. If exposure via external gamma is dominant, then the DCGL would have been calculated assuming uniform distribution in soil, and use of the measured concentration in the fines would overestimate the risk; an adjustment is needed. This point is discussed a bit on page 15-71, but not enough, in my view. The same question arose when I read p. 3-24, line 691 ff. |
| C229 | 10.4.2.1 | 10-31 | 1001-ff | This section implies total reliance on models for description of initial mixing and transport dispersion of radionuclides discharged to water. The use of dye or other tracer studies for complex situations should be acknowledged. |
| C230 | 10.4.3.2 | 10-33 | 1066-1068 | Use of inedible plants and non-game species as indicator organisms should be mentioned here. |
| C231 | 10.4.3.2 | 10-33 | 1073-1075 | This guidance is not very useful. Most agricultural fields and gardens are fertilized, and, except for TENORM situations or gross measurements, laboratories have no difficulty distinguishing the radionuclides of concern from natural radionuclides. |
| C232 | 10.4.3.2 | 10-33 | | In selecting foods and locations for food sampling, there is often the temptation to limit consideration of consumption habits to those of European-descended populations. The consumption and lifestyle habits of native peoples and other ethnic minorities can be quite different and should also be considered. It might be worthwhile to recommend this in MARLAP. |
| C233 | 10.4.3.2 | 10-34 | 1110-1113 | Again, laboratories will have no difficulty distinguishing anthropogenic radionuclides from 40K or 7Be. |
| C234 | 10.4.3.2 | 10-35 | 1127-1128 | Except perhaps for aesthetic reasons, why must stomach or rumen contents be collected within a brief period (two to four hours) after death? |
| C235 | 10.5.1 | 10-38 | 1221 | In my experience, "reliable calibrated air flow measuring device" on air sampling stations is an oxymoron. An alternative which may be a little less accurate, but far more reliable, is to simply measure the flow after placing a new filter on the device and then just before it is removed, and averaging the results. This average flow rate is multiplied by the run time (sampler should be equipped with a simple run-time meter) to get the total flow through the filter. The same flow rate meter, which is taken from station to station and checked frequently for calibration, provides good station to station precision in airflow. |
| C236 | 10.5.3 | 10-39 | 1286 | "...222Ra and 220Ra..." should be "...decay products of 222Rn and 220Rn..." Also radon decay products will always interfere with evaluation of both alpha and beta emitting radionuclides by gross particle counting unless time is allowed for them to decay or unless there are very large quantities of anthropogenic radionuclides on the filter. |
| C237 | 10.5.3 | 10-39 | 1287 | A holdup time of several days, not just several hours, is required if Rn-220 decay products are of concern since Pb-212 has a half-life of 10.6 hours. |
| C238 | 10.5.2 | 10-39 | 1261-1278 | Should Teflon (polytetrafluoroethylene, PTFE) fiber filters be cautioned against due to their high ashing temperatures and difficulty with digestion? |
| C239 | 10.5.3 | 10-39 | 1282-1283 | Folding filters for storage makes it difficult to do gross alpha and beta measurements with a proportional counter. |
| C240 | 10.5.4.2 | 10-41 | | Noble gases in air have also been collected for laboratory analysis by compressing air into SCBA tanks, by collecting in impermeable plastic bladders (e.g., Tedlar) for later compression, or by cryogenic methods. Radon is not an issue if laboratory analysis is delayed sufficiently for decay. |
| C241 | 10.5.4.3 | 10-41 | | Electrets can also be used for tritium monitoring at sufficiently high levels. Electrets were discussed for radon so a mention in the tritium section may also be appropriate. (e.g., RA Surette et al "Evaluation of electret ion chambers for tritium measurements," Health Physics 65:418-421(1993)) |
| C242 | 10.5.4.3 | 10-42 | 1377 | Although mentioned earlier, molecular sieve is not identified here for collecting tritium. It is being used increasingly because of favorable properties such as less retained water following bakeout and better collection properties in |

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| | | | | environments of fluctuating temperatures. |
| C243 | 10.5.5 | 10-42 | 1382 | The radon section should include a description of the methods for analysis of Rn-220 decay products and a paragraph on radon flux measurements. |
| C244 | 10.5.5 | 10-42 | 1382 | It would be appropriate to note here that MARSSIM Section 6.9 provides extensive guidance on radon measurement methods and instrumentation. |
| C245 | 10.5.5.2 | 10-46 | | While not necessarily a bad thing, there is a disproportionate amount of space devoted to radon. It is all good information, but invites the question why are there not other sections like "Selecting H-3 sampling methods Based on Data Quality Objectives" (DQOs) or for any other radionuclide as well? |
| C246 | 10.6.2 | 10-50 | 1656-1658 | It would be very useful to indicate or reference suitable combinations of liquid scintillation fluids (cocktails) and filters for the liquid scintillation method of wipe testing. |
| C247 | 10.7 | 10-53 | 1747 | It should be noted that the reference: Department of Energy (DOE), EML Procedures Manual (HASL-300), Environmental Measurements Laboratory, is available on CD and on the internet < http://www.eml.doe.gov/publications/procman.cfm >. It is no longer distributed in paper copy. This reference should be checked in other chapters as well. |
| C248 | 10 | 10 | | Some Chapters have references cited vs bibliography. Make reference as complete as possible. |
| C249 | 11.1 | 11-1 | 30 | This statement in association with the references, which are limited to radiological guidance, suggests that radiological safety is the only kind of safety that needs to be considered. |
| C250 | 11.1 | 11-1 | 30 | NRC 1998a is not listed in the references for this section. |
| C251 | 11.2.3 | 11-4 | 73-75 | Page 11-4 (lines 73-75) states that laboratory facilities that handle radioactive materials are required to have a radioactive materials license issued by the NRC or the Agreement State in which the laboratory operates, with the exception of certain DOE national laboratories and DOD laboratories. However, it is important to make clear that the latter facilities themselves cannot handle unrestricted levels of radioactive materials. They operate under similar types of regulation-driven restrictions as other laboratories, that are administered internally. |
| C252 | 11.3.1 | 11-6 | 137 | Page 11-6 seems to mandate a designated receiving location for all samples, and page 11-14 states that sample storage areas must be posted as radiation areas. For small projects or those limited to the analysis of very low levels of radioactivity, these apparent "mandates" may not be applicable or may even be counter-productive (e.g., by storing low-level samples together with high-level samples). |
| C253 | 11.3.2 | 11-8 | 207 | Guidance on line 207 of page 11-8 is to treat contaminated packing material and packages as radioactive waste; not mentioned is the possibility that there may be non-radioactive hazardous contaminants that would require the contaminated material to be classified as mixed waste. |
| C254 | 11.3.2 | 11-8 | 183-186 | This sentence, "An external exposure... ..working hours)." is redundant with a nearly identical sentence in the previous paragraph, lines 176-178. |
| C255 | 11.5.2 | 11-13 | 356-357 | On these lines it is stated: " <i>This documentation should be compared to separate paperwork obtained before sample receipt.</i> " What is this separate paperwork and who provides it? |
| C256 | 11.5.3 | 11-14 | 376 | Page 11-6 seems to mandate a designated receiving location for all samples, and page 11-14 states that sample storage areas must be posted as radiation areas. For small projects or those limited to the analysis of very low levels of radioactivity, these apparent "mandates" may not be applicable or may even be counter-productive (e.g., by storing low-level samples together with high-level samples). |
| C257 | 11 | all | | The relationships among various recommended documentation (" <i>Bench sheets,</i> " " <i>laboratory logbook,</i> " " <i>separate paperwork obtained before sample receipt,</i> " and " <i>documents listing requests for specific analyses</i> ") need to be made clear. Model documents would seem to be useful. |

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| C258 | 11 | 11 | | Address security issue? Might be important here as samples are open because of security and not put back in place. Samples by mail should not be irradiated. |
| C259 | 12.2.2.1 | 12-6 | 152ff | Tritium may also be a problem for cross-contamination if low level measurements are made in an environment where higher-level tritium sources are analyzed or in use. |
| C260 | 12.2.2.1 | 12-7 | 166-167 | Suggest changing to read: " <i>The laboratory may have background levels of radon progeny from natural sources in soil or possibly in its construction materials.</i> " |
| C261 | 12.3.1.2 | 12-17 | 423 | Shouldn't first word be "Adsorbed"? |
| C262 | 12.3.1.2 | 12-23 | 646 | It is not clear why ashing at 400 to 500 C is recommended for iodine when losses are reported as low as 450 C (Table 12.3) |
| C263 | 12.3.1.3 | 12-25 | 685-716 | This approach to weighing samples is certainly meticulous, but one wonders about its applicability to routine analysis of samples. If it is desired to retain this list, it would be useful to also provide an alternative, more practical, guide for weighing under less demanding circumstances. |
| C264 | 12.3.3.1 | 12-32 | 884 | This subheading, "12.3.3.1 Biological Samples" is redundant with "12.3.3 Biota Samples" |
| C265 | 12.3.3.2 | 12-33 | Table 12.4 | Table 12.4 recommends "burning" as the method to ash fish, meat and flour samples. Although drying, charring and ashing are discussed at length in the text there is no discussion of burning as a sample preparation step. Also this table is not cited from the text. |
| C266 | 12.5 | 12-34 | 973-974 | Suggest changing to read: "Wipe samples may be digested prior to analysis, but more commonly are simply placed into a liquid scintillation vial with cocktail and counted or directly analyzed with appropriate detectors such as proportional or Geiger counters." As written, this section implies that digestion is commonly used for wipe samples and that liquid scintillation is the only method of counting. This section and section 10.6 should be checked for consistency. |
| C267 | 12.8 | 12-40 | 1139 | In the section on bioassay samples, the MARLAP document should at least mention the Clinical Laboratory Improvement Act (CLIA) that requires a qualified laboratory director (generally and MD) for laboratories that perform clinical measurements. Some states have interpreted CLIA to include laboratories that analyze urine and fecal bioassay samples. |
| C268 | 12.9.1 | 12-46 | 1285-1286 | A more complete and useful reference is: Department of Energy, "RESL Analytical Chemistry Branch Procedures Manual", IDO-12096, U.S. Department of Energy, Idaho Falls, Idaho (1982). |
| C269 | 12 | 11 | | Citations of references do not follow a standard style. In most cases the simple author, year method is used (e.g., line 76), in others the title is additionally given in the text (e.g., lines 233, 672-673, 1047-1048), or even the nationality and discipline of the author is provided (e.g., line 730). Sometimes a citation such as "HASL-300" is given without author or date (e.g., lines 900, 919, 1147), but is listed under "U.S. Department of Energy..." in the reference section. In this example, there are even two editions of HASL-300 listed in the references (lines 1303 and 1308) so it may be important to know which one is meant. |
| C270 | 13.1 | 13-1 | 19 | insert "or mineral acids" between "with" and "water" |
| C271 | 13.1 | 13-1 | 28-30 | change the order to: (1) wet ashing, acid dissolution; (2) microwave digestion; and (3) fusion methods |
| C272 | 13.1 | 13-2 | 37 | insert "during sample pretreatment" after "explosions" |
| C273 | 13.1 | 13-2 | 48 | add two more useful references: Sample Pretreatment and Separation by Anderson and Chapman (1987); Chemical Dissolution of Metal Oxides by Blesa, Morando and Regazzoni (1994) |
| C274 | 13.2 | 13-2 | 52 | delete ", but usually the tracer is added to the sample" |
| C275 | 13.2.1 | 13-3 | 71 | change "many" to "some"; change "is" to "could be" |
| C276 | 13.2.1 | 13-3 | 82 | change "water" to "aqueous solutions" |
| C277 | 13.2.2 | 13-3 | 91 | replace "fluxes" to "reagents" |

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| C278 | 13.2.3 | 13-4 | 113 | replace "all chemical species present" to "the analyte of interest" |
| C279 | 13.4.1 | 13-14 | 432 ff | Oxidation reduction potential is in all chemistry books and need not be in this Chapter. Put Table 13.3 in Appendix |
| C280 | 13.2.3 | 13-5 | 137 | insert "fusion" before "fluxes" |
| C281 | 13.2.4 | 13-5 | 153 | change "radionuclides" to "elements" |
| C282 | 13.2.5 | 13-6 | 158 | insert "sometimes" before "required"; delete "and detection" |
| C283 | 13.2.5 | 13-6 | 171 | change "issues" to "possible interactions" |
| C284 | 13.2.5 | 13-6 | 172 | delete "during each step of the procedure"; redundant |
| C285 | 13.3 | 13-6 | 177 | replace "small" with "an appropriate" |
| C286 | 13.2.5 | 13-6 | 166-169 | delete the sentence that begins with "knowledge of the behavior ...", it does not add anything to the discussion |
| C287 | 13.3 | 13-6 | 181-182 | replace "wet ashing" with "acid treatment" |
| C288 | 13.3 | 13-7 | 190 | add "to a small" between "ground" and "mesh" |
| C289 | 13.3 | 13-7 | 219 | replace "fusions" with "During fusion, samples are heated ..." |
| C290 | 13.3 | 13-7 | 188-189 | delete "charring to remove organic material is not usually necessary because" and start the sentence on line 189 with "Samples with significant |
| C291 | 13.3 | 13-8 | 238 | add "remove and" between "to" and "dissolve" |
| C292 | 13.3 | 13-8 | 251 | replace "any" with "most" |
| C293 | 13.3 | 13-9 | 258 | Make sure that the statement about cleaning platinum crucibles in boiling HCl is correct. I think HCl can attack platinum? |
| C294 | 13.3 | 13-9 | 277 | What is meant by "etc."? |
| C295 | 13.3 | 13-9 | 279 | explain what is meant by "pyrosulfate fusions or reversible" |
| C296 | 13.3.3 | 13-13 | 391 | replace "chromatography" with "extraction" |
| C297 | 13.3.3 | 13-13 | 392-394 | other elements such as lead and polonium can also be volatilized during pyrosulfate fusion |
| C298 | 13.4.1 | 13-14 | 425 ff | Table 13.2: Can HCl alone dissolve cement? |
| C299 | 13.4.1 | 13-14 | Table 13.3 | Has the information been checked against the original reference for typing errors? |
| C300 | 13.4.1 | 13-17 | 554 | insert "for use in sample treatment with HF" after "preferred" |
| C301 | 13.4.1 | 13-18 | 556 | replace "boils at" with "is"; explain why "HF works most efficiently when used alone" |
| C302 | 13.4.1 | 13-18 | 561 | replace "chemical reactions" with "separation methods" |
| C303 | 13.4.1 | 13-18 | 564 | replace "wet ashing samples" with "sample dissolution" |
| C304 | 13.4.1 | 13-18 | 572 | Can HCl dissolve cement?; insert "completely" for "not" |
| C305 | 13.4.1 | 13-18 & -19 | 582-591 | The direct quote by "Sulcek and Povondra" is non-conforming with the text style |
| C306 | 13.4.1 | 13-19 | 595 | delete "wet ashing" and insert "dissolution" after "samples" |
| C307 | 13.4.1 | 13-19 | 621 | insert "concentrated" before "H2SO4" |
| C308 | 13.4.1 | 13-20 | 623 | insert "separation" before "procedures" |
| C309 | 13.4.1 | 13-23 | 709-710 | the sentence starting with "K2Cr2O7 is commonly mixed ...", is incomplete. |
| C310 | 13.6.1 | 13-26 & -27 | 831-853 | this section is too general and incomplete. It is of questionable value to the reader. |
| C311 | 13.6 | 13-26 | General | This section is not well-written and will require extensive editing. It is either too general or very specific with direct quotes from published papers. Some information is either incomplete or not useful. Also, the style is not consistent. This part should be deleted or presented differently. One way is to refer the reader to a specific publication(s) for each special matrix. This is a specific topic that requires specific information. |

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| C312 | 13.6 | 13-26 | | The document should include a section on determining solubility of particulate matter in body fluids. The solubility or clearance rate from the lung is a critical factor in dose estimates. |
| C313 | 13.6.4 | 13-28 | 870-884 | this information is not very useful |
| C314 | 13.6.5 | 13-28 | 885-909 | this information is incomplete and the reader would be much better served if only referred to the complete reports by Gibbs et al., 1978 and Peng, 1977. |
| C315 | 13.5.2 | 13-29 | 810 | replace "water" with "aqueous samples" |
| C316 | 13.7 | 13-29 | General | This section is not well-written and will require extensive editing. It is either too general or very specific with direct quotes from published papers. Some information is either incomplete or not useful. Also, the style is not consistent. This part should be deleted or presented differently. One way is to refer the reader to a specific publication(s) for each special matrix. This is a specific topic that requires specific information. |
| C317 | 13.7.1 | 13-30 | 930-931 | Why are HF and aqua regia not included? Who provided this definition? The above combination of acids can provide a very powerful acid leaching method for Pu from large size soil samples (up to 100 g). See Ibrahim et al., 1994; J. of Radioanalytical and Nuclear Chemistry, Vol. 177, No. 1, 127-138. |
| C318 | 13.8 | 13-32 | 1015 | explain "red or white fuming nitric acid" |
| C319 | 14.1 | 14-1 | 3 | What is meant by: The methods of ..., "Collection"? |
| C320 | 14.1 | 14-1 | 3 | detection of radionuclides are not similar to ordinary chemicals |
| C321 | 14.1 | 14-1 | 14 | What is meant by "agency procedural manuals", can you give examples? |
| C322 | 14.1 | 14-1 | 32 | delete "because the radiochemist detects atoms by their radiation" and start the sentence with "The success or ..." |
| C323 | 14.1 | 14-2 | 44 | move "(radiolysis)" to line 45 after "heat effects" |
| C324 | 14.1 | 14-2 | 53 | A proposed table summarizing the characteristics of alpha, beta and gamma radiation can be inserted (see Table 2 in main body of Panel review report) to illustrate that the extent of radiochemical separation is impacted, in part, by the type of radionuclide emission. This table relates directly to the understanding of the required chemical separation for each type of emission. |
| C325 | 14.2.1 | 14-2 | 57 | How is "detection of analyte, tracers, and carriers" related to "oxidation-reduction"? I don't think they are related. |
| C326 | 14.2.1 | 14-2 | 62 | change "number" to "state" |
| C327 | 14.1 | 14-2 | 35-37 | It gives the impression that coprecipitation is very specific and will yield "pure radionuclide, free of interfering ions". Coprecipitation is very seldom that specific. Re-word the sentence to reflect reality. |
| C328 | 14.2.1 | 14-2 & -3 | 68-70 | The statement "The differences ..." is not clear; give an example. |
| C329 | 14.2.2 | 14-4 | 103 | Shouldn't this read $U < Cl < F$? |
| C330 | 14.2.3 | 14-9 | 256 | before "radiolysis products ..." add "At high levels, radiolysis products ..." |
| C331 | 14.2.3 | 14-9 | 265 | under "notes" in Table 14.1, indicate that the color of the various chemical forms are visible only in the presence of significant amounts (mass) |
| C332 | 14.3.2 | 14-21 | 539 ff | Might be useful to provide diagrams of complexed and chelated metals--how the metal ion fits into the agent. |
| C333 | 14.8.2 | 14-63 | 1676 | Table 14.1: Shouldn't radium be included in the list of exceptions for sulfates? |
| C334 | 14.8.3.1 | 14-68 | 1819 | Just a quibble about solubility being dependent on particle size. I think of solubility being an inherent property of the solute in the limit of infinite time. Size affects mostly the rate of solution. While I understand the fact that molecules can redistribute from small to large particles at concentrations near saturation, I'm not sure that should be called a difference in solubility. |
| C335 | 14.10. | 14-107 | 2955 ff | Organization and headings: Call section 14.10 "Analysis of Specific Radionuclides", which is its subject, rather than |

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| | | | | "Chemical Equilibrium", which does not describe its contents. Then, place current sections 14.10.1 to 14.10.8 as subheadings in a new section 14.10.1 called "Introduction" or "Overview". Thus, current sections 14.10.9.1 - 14.10.9.12 become 14.10.2 - 14.10.13. To new section 14.10.1, add a brief explanation concerning the selection of the specific radionuclides that follow. The selection makes sense, but should be justified. |
| C336 | 14.10. | 14-107 | 2955 ff | The detailed descriptions of certain aspects of chemical behavior in current sections 14.10.1 - 14.10.8 should be referred to in the specific radionuclide sections to avoid considerable repetition concerning matters such as hydrolysis and polymerization. |
| C337 | 14.10.1 | 14-108 | 2978 | It should be realized that carrier added to a solid may not be uniformly interchanged with the radionuclide |
| C338 | 14.10.1 | 14-109 | 3008 | Were these salts mixed as solids or in solution and then the chloride was crystallized? |
| C339 | 14.10.7 | 14-116 | 3209 | Add that, for accuracy, S1/S2 should be significantly larger than 1. |
| C340 | 14.10.9 | 14-120 | 3347 ff | A section on a specific radionuclide usually is read to select or evaluate an analytical method. The contents will be most useful if each brief description is paired with the reference to the detailed description. The current practice of first describing all methods and then bunching the references at the end is not helpful. |
| C341 | 14.10.9 | 14-120 | 3347 ff | For specific radionuclides, extensive paragraphs that describe the occurrence, properties, and preparation of minerals and the metallic state should be deleted. Unless they are pertinent to the purpose at hand, a reader can look for these descriptions where the author obtained them. In a large tome such as this, the authors should limit themselves to pertinent information. |
| C342 | 14.10.9 | 14-120 | 3347 ff | The authors should reevaluate use of qualitative judgements of amounts of specific radionuclides, their toxicity, and the difficulty of analysis (examples are discussed elsewhere in this list of comments). The MARLAP document may somewhere have quantitative information or make reference to such information concerning amounts, doses and costs that could be used to place amounts and effects in perspective. |
| C343 | 14.10.9 | 14-120 | 3347 ff | I was surprised that Chapter 14 contained the very long sub-subsection (14.10.9) on specific radionuclides. The latter could easily have been a separate chapter or, perhaps better, an appendix. But it may actually be the section of most use to the laboratory faced with a specific type of analysis. |
| C344 | 14.10.9 | Various | Various | An additional reference for the "occurrences" sections for individual radioelements is the review of speciation, solubility, and sorption characteristics of specific radionuclides provided in Sections 6.3 and 6.4 of Conca (2000), a report that was prepared in order to support the performance assessment of the proposed repository at Yucca Mountain. Radionuclides covered by MARLAP that are also in that report include Pu, Np, Am, U, Tc, I, Cs, Ra, Sr, Th, and Zr. |
| C345 | 14.10.9.1 | 14-121 | 3361 | Replace "military" with "various plutonium" |
| C346 | 14.10.9.1 | 14-122 | 3394 | Do rocks actually absorb Am(III), or is it adsorption? |
| C347 | 14.10.9.1 | 14-125 | 3502 | It would be useful, here and elsewhere, to specify the alpha particle and gamma ray energies used for spectral analysis; if they are listed elsewhere in MARLAP, this list should be referred to for each radionuclide |
| C348 | 14.10.9.1 | 14-125 | 3509 | This mixture of references is not useful; the reader will want to be referred to specific papers for the method of interest. |
| C349 | 14.10.9.2 | 14-125 | 3518 | Information about the metal is not useful in MARLAP and should be deleted |
| C350 | 14.10.9.2 | 14-126 | 3527 | The only aspects of interest under "Occurrence" concern (1) stable cesium in media submitted for analysis that may affect the analytical results and (2) radioactive cesium in media submitted for analysis; delete all other contents. |
| C351 | 14.10.9.2 | 14-128 | 3595 | Give reference to the cited experiments |
| C352 | 14.10.9.4 | 14-137 | 3873 | Add I-123, according to line 3913 |
| C353 | 14.10.9.4 | 14-137 | 3873 | It is not true that "Iodine is ... never found in the elemental form." Brauer et al. (1976) measured the speciation of gaseous forms of iodine in the atmosphere and reported that a significant fraction was present as molecular iodine (I ₂). |

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| C354 | 14.10.9.4 | 14-137 | 3875 | An additional fairly recent reference that may be useful is the short literature review of 129I in the hydrological environment presented by Fabryka-Martin (2000). |
| C355 | 14.10.9.4 | 14-140 | 3963 | The discussion of toxicity and radiotoxicity in this paragraph is not appropriate in this context; any warning to analysts should be in specific terms about use, quantity and speciation. |
| C356 | 14.10.9.5 | 14-144 | 4088 | Delete the word "compounds" |
| C357 | 14.10.9.5 | 14-144 | 4089 | After "natural environment", insert "(e.g. the natural reactor at Oklo)" |
| C358 | 14.10.9.5 | 14-144 | 4103-4104 | The sentence beginning with "There are minute quantities of plutonium..." is redundant and irrelevant; delete. |
| C359 | 14.10.9.5 | 14-144 | 4108-4110 | Although plutonium from fallout was originated in air, over 99% now resides in soils and sediments. |
| C360 | 14.10.9.5 | 14-144 | 4109 | Add that most 238Pu in the environment was due to the high-altitude burnup of a SNAP-9 satellite power source. SNAP is the acronym for "Systems for Nuclear Auxiliary Power." Details on SNAP-9 worldwide fallout and 238Pu in the environment can be found in: R.W. Perkins and C.W. Thomas (1980) Worldwide Fallout. In: Transuranic Elements in the Environment, W.C. Hanson editor. |
| C361 | 14.10.9.5 | 14-144 | 4169-4184 | This discussion is much too general, inexact and most of the information presented is not supported by any literature references. |
| C362 | 14.10.9.5 | 14-144 | 4169-4184 | This discussion is misleading and overly generalized. I propose that it could read something like: "Because the solubility and sorption properties of most actinides is highly dependent not only on the chemical form of the element (speciation), but also on the oxidation state, it is often difficult to predict the mobility of this element in nature, particularly in the vicinity of fuel reprocessing plants and nuclear waste sites, where the subsurface water chemistry can vary greatly and depart from natural compositions due to the presence of man-made materials (e.g., cements and acids). The behavior of soluble plutonium is therefore unlikely to be similar from one location to the next. In addition, like americium and uranium, plutonium is capable of existing in multiple oxidation states simultaneously, and will tend to hydrolyze and polymerize in solution, further complicating the situation. In general, sorption of plutonium by surrounding rocks and soils is favored by water chemistries with low pH values although this is dependent also on available sorption sites (mineralogy), saturation and the presence or absence of colloidal forms. As a colloid, however, plutonium can travel rapidly and great distances through fractured rocks (e.g., contamination from underground nuclear tests at the Nevada Test Site). In conditions where plutonium occurs principally in particulate form, as a result of atmospheric testing for example, the average residence time for plutonium in waters with pH>7 appears to be proportional to the amount of suspended material. For this reason, more than 90 percent of plutonium is removed from coastal water. The residence time in mid-ocean water, where particulate matter is less, is generally much longer although concentrations can be greatly reduced by advective dispersion." |
| C363 | 14.10.9.5 | 14-147 | 4203 | Table 14.20: Should second Pu+3 be Pu? |
| C364 | 14.10.9.6 | 14-156 | 4475 | Same comment as given for line 3963 applies to "highly toxic" discussion |
| C365 | 14.10.9.6 | 14-159 | 4563 | Replace "SO4-2" with "SO3-2" |
| C366 | 14.10.9.6 | 14-159 | 4569 | Replace "BaIO3" with "Ba(IO3)2" |
| C367 | 14.10.9.6 | 14-159 | 4571 | Replace "Th(C2O4)" with "Th(C2O4)2" |
| C368 | 14.10.9.6 | 14-160 | 4616 | The interference is there, but can be corrected on the basis of secondary U-235 gamma rays |
| C369 | 14.10.9.6 | 14-160 | 4618 | "lengthy and expensive" must be placed in context: relative to what procedure, or what are the cost and time? |
| C370 | 14.10.9.6 | 14-160 | 4624 | Delete "alpha- or"; for reliable gamma counting, the radon gas must be uniformly distributed in the container |
| C371 | 14.10.9.6 | 14-161 | 4631 | Insert "beta, or gamma" after "alpha," |
| C372 | 14.10.9.7 | 14-162 | 4683 | Change "90Sr" to "88Sr" |

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| C373 | 14.10.9.7 | 14-163 | 4710 | Should "strontium carbonate" be "divalent strontium ions"? |
| C374 | 14.10.9.7 | 14-164 | 4742 | Add "to leach strontium" |
| C375 | 14.10.9.7 | 14-165 | 4770 | Add extraction of strontium with di-2-ethylhexyl phosphoric acid |
| C376 | 14.10.9.8 | 14-168 | 4868 | This section is incomplete, as indicated by more detailed discussions of solubilities in lines 4885, 4893, and 4950. |
| C377 | 14.10.9.8 | 14-168 | 4880 | This advice depends on the amount of Tc-99 handled, hence it does not apply to environmental samples; as indicated in the comment for page 14-140, line 3963, terms like "high specific activity" need to be replaced by quantitative guidance. |
| C378 | 14.10.9.8 | 14-172 | 5005 | How low is "low"? |
| C379 | 14.10.9.8 | 14-172 | 5020 | Replace "beta" with "conversion electron" |
| C380 | 14.10.9.9 | 14-178 | 5211 | insert "or stainless steel" after "platinum" |
| C381 | 14.10.9.10 | 14-181 | 5305 | Use "1.5" instead of "twice" |
| C382 | 14.10.9.10 | 14-182 | 5320 | Clarify "selectively exchange": do they selectively accumulate or release? |
| C383 | 14.10.9.10 | 14-183 | 5365 | Comment is needed here on the existence and extent of organically bound tritium (mentioned in line 5381) in the environment |
| C384 | 14.10.9.10 | 14-184 | 5388 | Mention here the process for oxidizing tritium to measure gaseous or organically bound tritium as tritiated water |
| C385 | 14.10.9.10 | 14-184 | 5391 | State here that the purpose is to measure tritium as gas in a gas-filled proportional counter |
| C386 | 14.10.9.10 | 14-185 | 5411 | Mention here use of azeotropic distillation with an organic solvent such as cyclohexane to extract tritiated water from biota samples |
| C387 | 14.10.9.11 | 14-186 | 5425 | The sentence beginning with "The ²³⁴ U that was formed" is irrelevant and confusing; delete |
| C388 | 14.10.9.11 | 14-186 | 5440 | Mention here that man-made U-236 can also be found |
| C389 | 14.10.9.11 | 14-187 | 5490-5491 | Lines 5490-91 should read: "For natural water compositions and under controlled conditions, although uranium metal will slowly decompose in water at room temperature, it can do so rapidly at 100/C." |
| C390 | 14.10.9.11 | 14-188 | 5508 | In line 5508, one could insert: "As in the case of americium and plutonium, uranium is capable of existing in multiple oxidation states simultaneously and is susceptible to complexation and hydrolytic reactions, such that its properties will vary greatly with differing water chemistries. In the vicinity of nuclear waste sites, for example, where ground water chemistries may be strongly modified by breached containment canisters, the solubility and sorption of uranium in groundwater can be very complex. Therefore, knowledge of the migration behavior of this element through soils and rocks requires the use of complex physically-based models which take into account pathways and evolving water chemistries. Conversely, uranium in nature is almost entirely in the IV and VI oxidation states..." |
| C391 | 14.10.9.11 | 14-195 | 5754 | more strongly than what or when? |
| C392 | 14.10.9.11 | 14-195 | 5756 | Should "Absorbance" be "Absorption"? |
| C393 | 14.10.9.11 | 14-196 | 5783 | Insert "or stainless steel" after "platinum" |
| C394 | 14.10.9.12 | 14-198 | 5839 | Delete gamma symbol at end (less than 0.01% gamma) |
| C395 | 14.10.9.12 | 14-200 | 5895 | Replace "very small quantities" with a description that places such quantities in context (e.g., quantities small compared to ...) |
| C396 | 14.10.9.12 | 14-200 | 5904 | Replace "monovalent" with "tetravalent" |
| C397 | 14.10.9.12 | 14-200 | 5914 | Insert "with analyses for other radionuclides" after "proceeding", if that is the intended meaning |
| C398 | 14.10.9.12 | 14-201 | 5928 | "high pH (1 - 2 M)" doesn't make sense; are some words missing? |
| C399 | 14.11 | 14-209 | 6166 | Are all three references to the same report in different years (lines 6171, 6175) needed? |
| C400 | 14.11 | 14-217 | 6383 | Replace "submitted to" with volume and page numbers |

| Row | Section | Page | Line | Technical Review Comment |
|------|------------|--------|---------|---|
| C401 | 14.11 | 14-217 | 6384 | This does not appear to be a readily accessible reference and should be replaced if possible. Others in this category are in lines 6388, 6429, and 6458 |
| C402 | 14.11 | 14-218 | 6427 | If this is more or less the same reference as on line 6424, delete it |
| C403 | 14.11 | 14-220 | 6461 | Reference is incomplete |
| C404 | 14.11 | 14-226 | 6620 | Move "Zolotov" to beginning of line; is this reference needed, since it is the same reference as in lines 6504 and 6526? |
| C405 | 14.10.9 | 14 | | Remove the various comments on the toxicity or hazard of a radionuclide except when advising on sample handling; if the reference to toxicity is intended to explain the purpose or required sensitivity of analysis, refer to a radiation protection text. |
| C406 | 15.1 | 15-1 | 26 | Vague. States "scintillation counters". This implies complete systems but I suspect it is intended to mean "scintillation detectors" consistent with instrumentation listed as "detectors" in lines 22-25 |
| C407 | 15.1 | 15-1 | 27 | "Multichannel analyzers" are a readout component that might be used with any of the three preceding detectors. |
| C408 | 15.1 | 15-1 | 21-27 | These lines leave a gap -- gives a variety of detectors but the only electronic package or readout instrument is the multichannel analyzer; it omits scalers and other analyzers. The electronic components or instrumentation that might be found include: (1) Simple counting systems (primarily scalers and ratemeters with simple baseline discriminators), (2) Energy-selective systems such as single-channel analyzers and the 1-, 2-, and 3-channel analyzers commonly found in the simpler liquid scintillation counting systems), and (3) Multichannel spectrometers (incorporating the MCAs of line 27). |
| C409 | 15.1 | 15-1 | 22-27 | The bullets are a mixture of detectors (lines 22-25), readout instrumentation (line 27), and complete systems (line 26). |
| C410 | 15 | 15-1 | General | Chapter 15 deals with two topics, 1) Instrument calibration and 2) test source preparation. Instrument calibration is intimately linked to Nuclear Counting Instrumentation (Chapter 15); the question arises as to whether it should be part of Chapter 15 (Nuclear Counting Instrumentation). Test source preparation deals with converting the collected and processed samples to a suitable form for introduction to the counting instrument. Test source preparation is the bridge to Chapter 15 (Nuclear Counting Instrumentation) from: Chapter 12, Laboratory Sample Preparation (for samples that need minimal preparation); Chapter 13, Sample Dissolution (for samples that need moderate preparation), and Chapter 14, Separation Techniques (for samples that need radiochemical preparation). The question arises as to whether Test Source Preparation should be a separate chapter either before or following the current Chapter 15. The common thread between the two parts of Chapter 16 (instrument calibration and test source preparation) is that both the test samples and the calibration samples should be prepared in the same, consistent manner. As a minimum, the document should be reviewed to assure that the wording in Chapters 12, 13, and 14 and at the beginning of the Test Sample Preparation part of Chapter 16 recognize and facilitate the linkages described above. |
| C411 | 15 | all | General | Revise the order of presentation and undertake some rewriting. We found that the chapter was confusing or repetitive because it is, in part, an ASTM text that the authors present in reversed order. |
| C412 | 15.1 | 15-1 | | Flow chart indicating steps and boxes and move boxes to connect sequences. Build a flow chart to show, and place at beginning of Chapter 15. |
| C413 | 15.1 | 15-2 | 38-39 | What is the difference between the line 38 "spectrometry (Section 15.5)" and the line 39 "spectrometry ... (Section 15.7)"? |
| C414 | 15.2, 15.3 | 15-2 | 44 ff | Sections 15.2 and 15.3 give similar considerations for alpha and beta, respectively, but are written in two different styles. |
| C415 | 15.2.1 | 15-2 | 58-59 | "analog-to-digital converters" (line 59) are not used in "all cases" (line 58), only in those systems using multichannel analyzers. |
| C416 | 15.2.1 | 15-3 | 63 | Source diameter is not an independent variable in this list; it is only important as it affects Geometry (line 62) or Self absorption (line 64). Do not hyphenate self absorption. |
| C417 | 15.2.1 | 15-3 | 71 | Suggest inserting "typically" between "counters" and "have". Why "Thus" in the second sentence? This statement does |

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| | | | | not follow from the preceding one. |
| C418 | 15.2.2.1 | 15-3 | 80-88 | Alpha-counting ion chambers are rather specialized (not just any old ion chamber), and are not too common (see pg 15-24, lines 731-735, discussion of gridded ion chambers, their high efficiency, and being replaced by semiconductor detectors.) This paragraph should start off by giving us a clue as to how they are used and the special considerations. |
| C419 | 15.2.2.2 | 15-3 | 89-99 | This section should lead off by saying where/how this type of detector is used and in what systems. |
| C420 | 15.2.2.2 | 15-4 | 114-115 | Should the efficiency for the windowless flow counter be given (as was done for window flow counter, line 120)? |
| C421 | 15.2.2.3 | 15-4 | 121-132 | This section should lead off with a statement as to where/how scintillation counters are used, in what type of system. |
| C422 | 15.2.2.3 | 15-5 | 133 | the statement "The counter size is limited by the multiplier phototube size" is not true. Scintillation detectors are commonly the same size as the phototube but there are detectors with light pipes connecting a large size phosphor to a smaller diameter PMT. |
| C423 | 15.2.2.3 | 15-5 | 133 | Photomultiplier tubes are referred to here as "multiplier phototubes." This is not the usual terminology and is jarring to the reader. |
| C424 | 15.2.2.3 | 15-5 | 133 | The convention for using metric notwithstanding, 51 mm PMTs and gas filled detectors were designed as, sold as, and commonly identified as 2-inch detectors. Therefore, in order to tie to conventional usage, I suggest using "51 mm (2 in)" -- here and elsewhere. |
| C425 | 15.2.2.4 | 15-5 | 156 | line 156 mentions planchet preparation, a subject that is not really covered until Chapter 16. At the least, a cross-reference to the appropriate section(s) would help. |
| C426 | 15.2.2.4 | 15-5 | 149 ff | Sections 15.2.2.4 and 15.3.3 deal with liquid scintillation counting for alpha and beta, respectively. Much of the material is applicable to both but not mentioned in both. Suggest there either be an earlier section on liquid scintillation counting in general or make Section 15.2.2.4 more complete and refer back to this section in 15.3.3. |
| C427 | 15.2.2.4 | 15-5 | 150-157 | This paragraph should include the statement that the sample-scintillator mix is placed in a vial transparent to the emitted light (glass or plastic). Vials are not mentioned until later on pg 15-9, line 265 (in the beta section). The statements in lines 156 and 157 are true but not evident from the information given unless the counting vial is mentioned. |
| C428 | 15.2.2.4 | 15-6 | 160 | Quenching is mentioned but not defined. (Later on pg 15-34, lines 1037- 1054 there is a pretty good description of liquid scintillation quenching.) |
| C429 | 15.2.2.5 | 15-6 | 191-193 | The comparison here of the semiconductor detector to the gridded ionization chamber is valid but "gridded" and the resolution were not mentioned in the early section on ion chambers -- you have to know more than was given in the earlier section in order to be able to follow this. |
| C430 | 15.3.2 | 15-8 | 225 | This statement is true if you are gross-beta counting a sample without chemical separation. However, the first paragraph of this section includes radiochemical separation. If there has been complete separation of the radionuclide of interest, gross counting is all you need! The author should have made a distinction between gross activity analysis and gross counting. Furthermore, this statement applies equally to alpha, beta, and gamma and should be in general section rather than only in this beta section. |
| C431 | 15.3.3 | 15-8 | 227 | See earlier comments re overlap with Section 15.2.2.4. |
| C432 | 15.3.3 | 15-8 | 246 | Again quenching is mentioned but is not really defined until later on pg 15-34. |
| C433 | 15.3.3 | 15-9 | 273 | Suggest add "in the medium" after "speed of light". |
| C434 | 15.3.3 | 15-9 | 275 | "wave shifters" should be "wavelength shifters". |
| C435 | 15.3.3 | 15-9 | 278 | Suggest add "(see Section 20.1)" after "mixed waste". |
| C436 | 15.3.5 | 15-10 | 306-308 | This is redundant with Section 15.3.1. |
| C437 | 15.3.6 | 15-11 | 323 | This is in the beta section, but most of it applies as well to alpha and gamma counting. |

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| C438 | 15.3.6 | 15-11 | 324 | Do any modern systems still use a mechanical register? Or should this be deleted? This sounds like it was lifted from an old document. |
| C439 | 15.3.6 | 15-11 | 324, 325 | A number of system components are named but I don't believe their functions have been given |
| C440 | 15.3.6 | 15-11 | 334-348 | This explains the characteristics of and differences between various gas-filled detectors (which were introduced earlier). Is this necessary? If so, it should appear earlier -- before the introduction of ion chamber, proportional, and GM detectors. |
| C441 | 15.4 | 15-12 | 359 | Various places in this section present materials applicable to both scintillation detectors (such as NaI) and to semiconductor detectors (such as HPGe), other parts are specific to one or the other; however, this isn't always clear to the uninitiated reader. |
| C442 | 15.4.1 | 15-12 | 361 | The statement about non-destructive measurement is not always true and to a certain extent misleading. Yes, relatively non-destructive gamma measurements are made. However, in many cases the sample is processed in some fashion first: e.g., grinding, sieving, ashing, evaporation to reduce volume, ion exchange, etc. Furthermore, gamma counting is also used to count radiochemically separated portion of samples that have been destructively processed. |
| C443 | 15.4.1 | 15-12 | 371 ff | Abrupt change of thought in the middle of this paragraph. |
| C444 | 15.4.1 | 15-12 | 382 ff | At this point it would be instructive to state that photoelectric events can be used to identify and quantitate specific nuclides in a mixture. |
| C445 | 15.4.1 | 15-13 | 389 | Change "In solids such as NaI(Tl) or CsI ... " to "In solids such as the scintillation detectors NaI(Tl) or CsI ... ". |
| C446 | 15.4.1 | 15-13 | 410-422 | This is, for the most part, redundant with pg 15-12, lines 371-382. |
| C447 | 15.4.1 | 15-13 | caption | Figure 15.2 caption: Add the words "from Semiconductor Detectors". (The text referring to this figure (called out on line 418) has been talking about both scintillation and semiconductor detectors, but this is very definitely a spectrum from a semiconductor detector.) |
| C448 | 15.4.1 | 15-14 | 441-444 | Again a reference to gross counting which has never been well defined in either the beta or the gamma section. You have to be already knowledgeable to follow this. |
| C449 | 15.4.1 | 15-15 | 457-474 | This section introduces a number of technical terms (pulse pileup, rise time, pole zero, etc., but not enough information for them to have meaning to anyone not already knowledgeable. |
| C450 | 15.4.1 | 15-15 | 460-474 | This is a laboratory manual, the most practical solution in most cases will be dilution rather than distance, collimation, or detector size. These later solutions are more like to be applied to process line monitoring or to emergency effluent monitoring than to laboratory sample analysis. |
| C451 | 15.4.1 | 15-15 | 460-474 | These high count rate effects are possible for "process", some radioactive waste, and activation analysis samples, but are not likely to be a problem for general environmental samples. The reader should be given a little more guidance on when to be alerted for these effects. |
| C452 | 15.4.2 | 15-16 | 518 | Abrupt jump from HPGe to NaI scintillation. In addition, this sentence doesn't read very well. It would read better if it said something like "The most widely used size of NaI(Tl) detector is the 76 x 76 mm (3 x 3 in)". |
| C453 | 15.4.1 | 15-16 | 493-496 | This is specific to NaI(Tl) scintillation and a sudden switch after previous discussion and figures dealing primarily with HPGe. Similar information should be given for HPGe; especially since this is the detector of choice for resolving complex spectra. |
| C454 | 15.4.2 | 15-16 | 502-503, Fig 15.4 | 35% and 70% are not explained; this could easily be confused with absolute efficiency. This explanation does not occur until later on pg 15-26, lines 809-810. |
| C455 | 15.4.2 | 15-16 | 504, 505 | What do "vespel well" and "Mg well" mean? |
| C456 | 15.4.2 | 15-16 | 518, 523 | Suggest putting detector size in inches in parentheses following the metric size -- for same reasons given for pg 15-5, line |

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| | | | | 133. |
| C457 | 15.4.2 | 15-16 | | The line codes in the key for figure 15.4 cannot be distinguished. The position order in the key is inverted from the position order in the figure. This is an unnecessary complication for the reader and not good communication. |
| C458 | 15.4.2 | 15-17 | 540 | Table 15.1: The geometries for each of these sample configurations should be more explicitly defined. I assume that the filter paper (column 2), the planchet (column 3), and the AL can (column 4) are placed directly on top of an upright detector. |
| C459 | 15.4.2 | 15-17 | 555 | Table 15.1: Here the detector size is given in inches without the metric equivalent. Be consistent and also see earlier recommendations re detector size convention. |
| C460 | 15.4.3 | 15-18 | 561 | how about 76 x 76 mm (3 x 3 in)? |
| C461 | 15.4.3 | 15-18 | 569 | States "... gamma ray spectrometer system." However the following description is for a single channel gamma ray spectrometer system and there is no mention of the more preferable multichannel spectrometer system. Was this perhaps adapted from an out-dated reference? |
| C462 | 15.4.3 | 15-18 | 571 | First column entry is for Preamplifier but second column gives description of the main amplifier. No column two entry for Preamplifier; no column one entry for main amplifier. |
| C463 | 15.4.3 | 15-18 | 560 ff | The section title says "Detector Assembly" and the first paragraph deals with the detector. However, the second paragraph deals with all the other components of the system. A more appropriate title would be "Sodium Iodide Counting System." |
| C464 | 15.4.3 | 15-18 | 572-573 | Between lines 572 and 573: Column two entry for sample mounts and containers but no column one entry. (This also screws up the line numbering sequence!) |
| C465 | 15.4.4 | 15-19 | 576 | "None of the configurations of germanium detector .. can be operated at room temperature ..." would be a better choice of words than "Any type of <u>germanium</u> ... cannot be operated at room temperature ...". This refers to configuration of <u>germanium</u> detector, not type of germanium. Also "No ... can" is less ambiguous than "Any ... cannot". |
| C466 | 15.4.4 | 15-19 | 590-592 | These two sentences pertain to choosing between NaI and HPGe and it seems as though the statement should come earlier. However, I don't have a specific suggestion. |
| C467 | 15.4.7 to 15.4.9 | 15-20 | 612-629 | These are three sections (15.4.7, 15.4.8, 15.4.9) on less commonly used scintillation detectors and they seem like orphans. How about grouping all scintillation detectors together in one place and then go on to expand on the more common NaI? Or in a single section, "Other scintillation detectors"? |
| C468 | 15.4.9 | 15-21 | 629 | I don't believe "photofraction" has been defined in this document. Should it be? |
| C469 | 15.5 | 15-21 | 630 | The title "Spectrometry Systems" is misleading. The most common spectrometry systems were covered earlier; these are special systems. |
| C470 | 15.5 | 15-21 | 631 | I dispute the statement "commonly used for gamma-ray spectrometry". Unless I've really lost touch with things, these are uncommon systems! Also "... commonly use ..." should be "... commonly used ..." |
| C471 | 15.5.4 | 15-22 | 661 | this statement needs a reference. |
| C472 | 15.6.2 | 15-23 | 683-698 | Does this section have any practical significance in this document? |
| C473 | 15.7 | 15-24 | 717 ff | Section 15.7 is redundant with much of the early material but is written more in the style of the rest of MARLAP. This section answers many of the questions raised in reading the earlier sections. It might be worthwhile for the earlier sections to be merged into 15.7. Perhaps much of the overlap and difference in presentation in this chapter could be overcome by reorganizing the chapter |
| C474 | 15.7 | 15-24 | 718 - 889 | This first part of the section should have some subsections (such as for alpha, beta, and gamma) to provide more balance with existing subsections 15.7.1 and 15.7.2, which are really secondary in importance to this earlier material. |
| C475 | 15.7 | 15-25 | 752 | This paragraph needs more introduction. Why is it important to know about the Heath spectrum catalogs? |

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| C476 | 15.7 | 15-26 | 803, 810 | Crystals in inches as well as mm? |
| C477 | 15 | 15-26 | General | Starting from this page, the chapter reads very well. This section should be used as a guideline for the earlier parts of the chapter. |
| C478 | 15.7 | 15-27 | 828 | Crystal in mm as well as in? |
| C479 | 15.7 | 15-28 | 847 | This sounds like end cap specifications for a low energy detector. |
| C480 | 15.7 | 15-28 | 857, 858 | 76 x 76 mm (4 x 4 in). |
| C481 | 15.8 | 15-31 | 956-959 | This paragraph on counter background seems to be an orphan in the Shielding section. This should go earlier in the chapter as a prelude to the various background reduction strategies. |
| C482 | 15.9 | 15-31 | 969-975 | Are standards of all radionuclides available from NIST or is it necessary to go out of the country for some? (Ex. IAEA) |
| C483 | 15.10.1.1 | 15-32 | 983 ff | This section is redundant with Chapter 16. It should be deleted. |
| C484 | 15.10.1.1 | 15-32 | 988-989 | What is the relevance of this cesium-137 gamma radiation to alpha detection? |
| C485 | 15.10.1.1 | 15-33 | 1002, 1014 | Paragraphs starting lines 1002 and 1014 are redundant. |
| C486 | 15.10.1.1 | 15-34 | 1049 | This diagram is not very clear. What do the underlined spaces and the vertical lines mean? Are some arrow heads missing? |
| C487 | 15.10.1.1 | 15-34 | 1059 | Should be "calibration, attenuation . . ." |
| C488 | 15.10.1.1 | 15-34 | 1037-1048 | Here is the definition of quenching that should be moved to earlier in the chapter. |
| C489 | 15.10.1.4 | 15-37 | 1124 ff | line 1124 ff introduces the control chart, but it is not fully discussed with an example until Section 18.3.2. Probably should be a early cross reference, especially to the example chart on p. 18-7. |
| C490 | 15.10.1.4 | 15-39 | 1183 ff | The writing suddenly becomes very specific and prescriptive. |
| C491 | 15.10.2.1 | 15-40 | 1232-1240 | "Gross" activity measurement is a little better described here. (See comments for page 15-8, lines 225-226, and for page 15-14, lines 441-444) |
| C492 | 15.10.3.1 | 15-47 | 1431 | Equation 15.1 needs a lead in. |
| C493 | 15.10.3.1 | 15-47 | 1431-1450 | And what are you supposed to do with the results of these equations? (eqns 15.1 to 15.3) |
| C494 | 15.10.4.1 | 15-52 | 1586, 1588 | Shouldn't "234U" be "233U"? Spike is 233U (line 1585). |
| C495 | 15.10.4.3 | 15-54 | 1651 | neutron flux is in "n", not "ng". Is the notation "n/cm2/s" consistent with the rules for this publication? |
| C496 | 15.10.4.3 | 15-54 | 1662 | neutron flux is in "n", not "ng". Is the notation "n/cm2/s" consistent with the rules for this publication? |
| C497 | 15 | All | | In this chapter, wouldn't it be more efficient to describe proportional counters and scintillation counters (or even each of the various types of detectors) first and then go to specific radiation types, and thus avoid having to repeat the description for each type of radiation? |
| C498 | 15A | All | | Is any of this redundant with other Chapters on calibration of QA? |
| C499 | 16 | All | | Chapter 16 addresses standard reference materials (usually solution standards) which are used to make up instrument calibration standards. Also important are the matrix-specific reference materials that are used to check for recoveries from various matrices and to QA for matrix-specific effects in sample preparation, dissolution, and separation. A cross-reference should be made here to Section 18.4.4, which discusses these materials. |
| C500 | 16 | All | | It is not clear what is the role for commercial, plated alpha and beta sources, particularly for alpha spectrometry. What are the considerations, cautions, correction factors, etc. if a laboratory chooses to purchase these sources rather than custom making sources from calibrated solutions? |
| C501 | 16 | All | | Chapter 16 seems to be straight forward and unambiguous with a good balance between the general performance and the prescriptive. |
| C502 | 16 | All | | Some of the instrument descriptions in this chapter are better than the ones in Chapter 15. |

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| C503 | 16 | All | | There are a number of instances with overlap with other chapters; however, this probably cannot be avoided. |
| C504 | 16 | All | | Integrate with chapters 12 – 15 by suitable references in these preceding chapters to the pertinent discussions in chapter 16. |
| C505 | 16 | All | | I was surprised that the topic covered by Chapter 16 (which includes advice on test source preparation) was discussed after the topics in Chapter 15 (which covers counting after the source has been prepared) |
| C506 | 16 | All | | Chapter flows well as written, so leave chapters as they are but do better road map on what this section is all about and how the Chapters 15, 16 are interrelated. |
| C507 | 16.2.2 | 16-3 | 76 | Is there another word that can be used instead of "Correspondence"? (congruity, harmony, harmonization, etc.?) It is a perfectly good word for what it is meant here, but it conjures up the image of mail or e-mail. |
| C508 | 16.3.3 | 16-6 | 161 | Show how this scattering/self-absorption factor is used (give a correction equation?). |
| C509 | 16.4.1.2 | 16-11 | 311-318 | If this is not mentioned in Chapter 15, it should be. |
| C510 | 16.4.2 | 16-11 | 333-335 | Redundant with what is (or should be) in Chapter 15; but that's probably alright. |
| C511 | 16.5.1 | 16-14 | 413-414 | Insert "such as 89Sr and 90Sr" just after "... not accompanied by a gamma ray". Delete "89Sr and 90Sr" from their present position and leave the rest of the radionuclides where they are. |
| C512 | 16.5.2 | 16-15 | 462 | Shouldn't "aliquant" be "aliquot"? (same question arises in other parts of this chapter) |
| C513 | 16.5.2.1 | 16-16 | 500-507 | Quenching was discussed in Chapter 15, but this is a much better description. |
| C514 | 16.5.2.1 | 16-17 | 530 | Should "... channels ratio" be "... channels ratio method"? |
| C515 | 16.6.1 | 16-18 | 557-562 | Here is some bridge material from Chapters 12 and 13. |
| C516 | 16.6.1 | 16-19 | 589-597 | More bridge material from earlier chapters. |
| C517 | 16.7.5 | 16-27 | 844 | Why isn't radon in this list? |
| C518 | 16.7.5 | 16-27 | 844 | Add the isotopes of Rn to the list of radioactive noble gases. |
| C519 | 16.7.5 | 16-27 | 851, 852 | "Media" should be "medium" (singular); insert "or" before "peroxide"; substitute for the final clause "with the medium then analyzed by scintillation spectrometry". |
| C520 | 16.7.5 | 16-28 | 890 | Another instance of non-SI units (cfm) |
| C521 | 17 | All | | Many of the terms and acronyms were poorly explained. |
| C522 | 17 | All | | Many of the units associated with terms from the equations are inconsistent from one equation to the next. |
| C523 | 17 | All | | Several Figures are unclear due to small font size or poor contrast (fig 17.3, Fig 17.4, Fig 17.5). |
| C524 | 17 | All | | On another note, I found the text to be very well written with the exception of some repetitions and redundancies. I would like to compliment the author(s) on a thorough job for this Chapter. |
| C525 | 17 | All | | There appear to be typos in some of the equations. In any case, all equations need to be thoroughly checked throughout the document. |
| C526 | 17 | All | | Many of the references both in the text and in the Reference section are incomplete, missing or wrong. All references should be thoroughly checked and a format common to the entire MARLAP manuscript should be adopted. |
| C527 | 17.1 | 17-2 | 46 | Change of text: '...assist in the data validation process (Chapter 8). Support material can include information on...' |
| C528 | 17.2 | 17-2 | 54 | Addition of text: 'Data acquisition in this context, refers to the process of collecting the basic information produced by nuclear...' |
| C529 | 17.2 | 17-2 | 61 | Deletion of text: '...transferred to the next data-reduction step. Electronic transfer should be employed as...' |
| C530 | 17.2.1.1 | 17-4 | 118 | I initially stumbled on "proportional" because I tend to think of uncertainty as relative (e.g., percent uncertainty) and wanted to insert "inversely". I now recognize that the statement is accurate, but maybe you want to add "absolute" before "uncertainty" on line 117, and even add a sentence: "The relative uncertainty is therefore inversely proportional to the |

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| | | | | square root of n." |
| C531 | 17.2.1.3 | 17-6 | 159 | Addition of word: 'The output of some instruments is very basic, primarily counting data, i.e., total counts or counts per...' |
| C532 | 17.2.2 | 17-7 | 191 | Change of text: ' $t_{\text{sub c}}$ = real time (actual clock time) of counting...' |
| C533 | 17.3.1 | 17-9 | Figure 17.1 | Gamma-ray spectrum: index the photopeaks P1 and P2 as referred to in the text, lines 266-267. |
| C534 | 17.3.1 | 17-11 | Figure 17.2 | Gamma-ray analysis sequence: enlarge figure so that the entire width of the page is taken advantage of. This will allow to represent the boxes labeled "Report", "Calculate Uncertainty", "Concentration", "Resolve", etc... as larger, and dispose of flow chart in a clearer way. |
| C535 | 17.3.1.1 | 17-12 | 309-310 | Addition of text: 'As previously stated, the photopeak has a basic Gaussian shape; in reality it is a histogram with a Gaussian-like shape, unless interference effects are present as in a multiplet.' |
| C536 | 17.3.1.4 | 17-14 | 386 | Addition of text: '...normally quoted in terms of its full width at half maximum or FWHM (c.f., Chapter 18, section 18.5.3.2.). For a discussion...' |
| C537 | 17.3.1.4 | 17-16 | Figure 17.3 | Low-energy tailing: Clean-up this figure so that the information beneath the spectrum is clearly visible and highlighted, i.e., "FWHM", "DC", etc... Increase the font size of the abscissa and ordinate headers. |
| C538 | 17.3.1.5 | 17-17 | Figure 17.4 | Photopeak baseline continuum: Increase the overall size of figure or increase the font size of the text. |
| C539 | 17.3.2 | 17-24 | 606 | Addition/modification of text: '...counts, a region of interest or ROI-type analysis is usually performed. However, peak fitting programs are...' |
| C540 | 17.3.3.8 | 17-32 | 829 | On pages 17-6 and 17-7, the notation $C(\text{sub net})$ is used for the difference of $C(\text{sub G})$ and $C(\text{sub B})$. Why not here (Eqn 17.21) and in the next two equations (17.22 and 17.23)? Or do I misunderstand? |
| C541 | 17.3.3.8 | 17-32 | 833 | Change of units: ' $\epsilon_{\text{sub q}}$ = the radionuclide quench corrected counting efficiency (cps/dps)' [instead of "c/d"] |
| C542 | 17.4 | 17-33 | 857 | Change of units: ' ϵ = the gross or radionuclide counting efficiency cps/dps' [instead of "c/d"] |
| C543 | 17.4 | 17-34 | Equation 17.26 | Equation 17.26: The second term of the equation $\sum m^{\{2i\}} u^{\{2\}} (a_{\text{sub } i})$ appears to be incorrect and should read: $\sum m^{\{i\}} u^{\{2\}} (a_{\text{sub } i})$ (I.e., the m term should be raised to the power of i, not 2i) |
| C544 | 17.5.2 | 17-38 | Table 17.1 | Units For Data Reporting: Generalize this type of Table so that can be used throughout the MARLAP document. In this way, where applicable, similar data can be captured everywhere, for each MARLAP Chapter. |
| C545 | 17.5.2 | 17-38 | Table 17.1 | An attempt at respecting the same "Title" format as the Figures in this Chapter and indeed throughout the document would also be preferable: e.g., Table 17.1-Units for data reporting |
| C546 | 17.5.4 | 17-39 | 989 ff | Shouldn't the output charts of spectrometers also be provided on request? I'd like to see visually what was counted as a peak and what was not. |
| C547 | 17.8.1 | 17-41 to -42 | 1039-1082 | Cited References. Several references cited in the text, are not in this section but are mistakenly cited in the section 17.8.2 Other Sources. These need to be taken out of the latter and included in the former section (i.e., 17.8.1). |
| C548 | 17.8.1 | 17-41 to -42 | 1039-1082 | Nearly all references are incomplete and some do not even have publication dates let alone page numbers. |
| C549 | 17.8.1 | 17-41 to -42 | 1039-1082 | The format of the reference sections is variable to non-existent. Suggest that a common format be adopted for all references throughout the MARLAP document. |
| C550 | 17.8.1 | 17-41 to -42 | 1039-1082 | Suggest that all references in text be accompanied by the date of publication to distinguish various publications. |
| C551 | 17.8.2 | 17-42 to -44 | 1083-1134 | Several References in this "Other Sources" section are cited in the text and should be transferred to section 17.8.1. These are cited in comments for lines 1091, 1104, 1106, and 1122. |
| C552 | 17.8.2 | 17-43 | 1091-1092 | Debertin, K. and Helmer, R.G., 1988... This reference belongs between lines 1045 and 1046 of section 17.8.1. |
| C553 | 17.8.2 | 17-43 | 1104-1105 | This reference belongs between lines 1057 and 1058 of section 17.8.1. |

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| C554 | 17.8.2 | 17-43 | 1106-1107 | Holm, E., Rioseco, J., and Garcia-Leon, M., 1984... This reference is incorrect in the section. The correct reference is cited in section 14.11, p. 14-212, lines 6248-6249, |
| C555 | 17.8.2 | 17-43 | 1106-1107 | This reference belongs between lines 1060 and 1061 of section 17.8.1. |
| C556 | 17.8.2 | 17-44 | 1122 | Reference belongs between lines 1079 and 1080 of section 17.8.1. |
| C557 | 18 | All | | This Chapter was very well written and the presentation of the material was very accessible. Again, I would like to compliment the author(s) on a thorough job for this Chapter. |
| C558 | 18 | All | | The greatest problem resides in the presentation of the references in the text, which should be accompanied by a date of publication to distinguish these from earlier versions of the same documents. Reference section needs work and the format needs to be consistent throughout the section as well as throughout the MARLAP document (i.e., from Chapter to Chapter). |
| C559 | 18 | All | | Check Figures and Tables for typos |
| C560 | | All | | All equations in this Chapter are straight forward and appear to be correct, however the indexing of the equations should be modified from: (1), (2), (3), etc... to: (18.1), (18.2), (18.3), etc, to match other Chapters. |
| C561 | 18.4.1 | 18-12 | 321 | Addition of text: '...should be checked, and batches identified by serial number. When a sudden, significant increase in the blank occurs in conjunction...' |
| C562 | 18.4.1 | 18-12 | Figure 18.2 | Three general categories of blank changes: Add under the heading RAPID CHANGES a bullet for INTRODUCTION OF NEW REAGENT BATCH OF DIFFERENT COMPOSITION. |
| C563 | 18.4.1 | 18-12 | Figure 18.2 | Under the heading HIGH VARIABILITY one could add SAMPLE HETEROGENEITY. |
| C564 | 18.4.4 | 18-18 | 509-533 | In addition to NIST, another widely-used supplier of standard reference materials is the International Atomic Energy Agency (IAEA). Examples of the materials available from this agency include IAEA Analytical Quality Control Services (AQCS) Reference Materials for the Determination of Radionuclides: a) Biological Materials of Marine Origin (fish and shellfish); b) Biological Materials of Terrestrial Origin (milk and dairy products, grass, other vegetation, bone); c) Non-biological Materials of Marine Origin (sediments), and d) Non-biological Materials of Terrestrial Origin (soil and lake sediments) [IAEA-AQCS, 2002].. |
| C565 | 18.4.4 | 18-19 | 550 | Insert at end of first sentence "or in the sample preparation process" |
| C566 | 18.4.4 | 18-20 & 21 | Table 18.2c | Uncertified Massic activities....: Need to specify under the heading Half Life whether the values are in minutes, hours, or days for the elements 129I, 155Eu, 210Pb, 234U, 235U, 237Np, 238U, and 241Am. |
| C567 | 18.4.4 | 18-20 & 21 | Table 18.2c | An attempt at respecting the same "Title" format as the Figures throughout the MARLAP document would also be preferable. |
| C568 | 18.4.4 | 18-20 | Tables 18.2a, b, c | All need to have the uncertainty changed from "Mean +/- 2s{sub m}" and "Half-Life +/- 1s", changed to either "Mean +/- 2s{sub m}" and "Half-Life +/- 2s" or "Mean +/- 1s{sub m}" and "Half-Life +/- 1s" (i.e., should be consistent in size of uncertainty used in all columns of all tables) |
| C569 | 18.4.5 | 18-23 | | Figure 18.4: Suggest removing "Excursions" from title box for consistency with other charts. |
| C570 | 18.5.3.2 | 18-35 | 1030 | Would this be clearer if you inserted "the energy at" before "the most probable peak height"? Or do I misunderstand? |
| C571 | 18.5.4.2 | 18-40 | 1181 | Addition of text: '...electroplated sources, crosstalk may be as low as 1 percent for betas in the alpha channel and 3...' |
| C572 | 18.5.6 | 18-41 | Table 18.5 | Instrument calibration: example frequency and performance criteria: Under the heading Performance Criteria, under Initial Calibration, one needs to replace the uncertainty (2s) by uncertainty (2s). |
| C573 | 18 | 18-55 to -57 | 1642-1710 | Cited Sources, Section 18.7.1: Many of the references are incomplete and some do not even have publication dates let alone page numbers. The format of the reference section is variable. Suggest that a common format be adopted for all references throughout the MARLAP document. Suggest that all references in text be accompanied by the date of |

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| | | | | publication to distinguish various publications. Several references in this section are not referred to in the body of the text and need to be moved to section 18.7.2 Other Sources. |
| C574 | 18.7.2 | 18-57 to -58 | 1711-1723 | Other Sources: Many of the references are incomplete and some do not even have publication dates let alone page numbers. |
| C575 | 18.7.2 | 18-57 to -58 | 1711-1723 | The format of the reference section is variable. Suggest that a common format be adopted for all references throughout the MARLAP document. |
| C576 | 18.7.2 | 18-57 to -58 | 1711-1723 | Several references in this section are missing and are located in the other section (i.e., section 18.7.1), see above. |
| C577 | 18A | 18-59 | | As in Chapter 18, the indexing of the equations needs to be modified so as to be similar to that used in other Chapters. Otherwise these sections are very well presented. |
| C578 | 18A | 18-70 | 1955-1996 | Many of the references are incomplete and some do not even have publication dates let alone page numbers. |
| C579 | 18A | 18-70 | 1955-1996 | The format of the reference section is variable. Suggest that a common format be adopted for all references throughout the MARLAP document |
| C580 | 18A | 18-70 | 1955-1996 | Suggest that all references in text be accompanied by the date of publication to distinguish various publications. |
| C581 | 18B | 18-71 | | With the exception of the equation indexing there are no problems with the References either in the body of the text or in the Reference section itself. The Problems and their solutions are well presented and the section is very useful as an illustration of additional statistical methods available to the user of control charts. |
| C582 | 18A | 18-59 | | Attachments 18A and 18B are very useful additions to Section 18.3.2. Statistical Means of Evaluating Performance Indicators-Control Charts. More specifically attachment 18A served as a guide to the various control charts and their use in the statistical evaluation of data sets. I did not take it upon myself to verify the solutions to the problems given in the section and suggest that this be done using an internal QA procedure for all statistical and numerical problems and equations throughout the MARLAP document. |
| C583 | 18B | 18-71 | | Attachment 18B. No comments for this Attachment. With the exception of the equation indexing there are no problems with the References either in the body of the text or in the Reference section itself. The Problems and their solutions are well presented and the section is very useful as an illustration of additional statistical methods available to the user of control charts. |
| C584 | 19 | All | | The reference “Borak, Thomas B (editor), 2000. Application of Probability and Statistics in Health Physics” could be cited as a general supplementary reference for Chapter 19 (Measurement Statistics) of MARLAP. The book contains useful information on uncertainty analysis, Monte Carlo methods, Bayesian statistics, etc. |
| C585 | 19.2.1 | 19-3 | 62 | Page 19-7 makes it clear that "distribution function" is the same as "cumulative distribution function" (CDF) for those of us who are used to the more complete wording. Maybe it should be said here, too. |
| C586 | 19.2.1 | 19-3 | 89 ff | The discussion of mode seems incomplete. If mode means most likely value, then every point in a rectangular distribution would be a mode. To me, mode means a local peak in the density function. Then it is then easy for a function to be multi-modal without the peaks all being the same height. |
| C587 | 19.2.1 | 19-4 | 95 | The median is unique except for the case where you have two non-overlapping segments. That is, if the likelihood is positive everywhere, the median is unique. Do we really need this sentence? |
| C588 | 19.2.1 | 19-4 | 95 | How can the median not be unique? Isn't it where the monotonic CDF crosses 50%? Of course, a distribution could say that no values between x and y are possible, and that x just happens to be at the 50% mark of the CDF, but is that realistic |

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| | | | | for radioanalytic measurements? |
| C589 | 19.2.1 | 19-5 | 106-111 | What do these lines mean? Correlated with respect to what? |
| C590 | 19.2.1 | 19-5 | 122-127 | Use language that is more colloquial, with presentations of concepts that will be easier to understand by the target audience. For example, the presentation of statistical independence vs. correlation provided on page 19-5 lines 122-127 is unnecessarily complicated and probably not even necessary. |
| C591 | 19.2.2 | 19-6 | 158 | Mode is non-rigorous - it is really a local maximum of the PDF - which is how we get multi-modal distributions. |
| C592 | 19.2.2 | 19-6 | 147-148 | Estimator is defined as follows: "A random variable whose value is used to estimate an unknown parameter p is called an estimator for p ". The definition as presented implies that only random variables are estimators. It would seem that some estimators may be deterministic. |
| C593 | 19.2.2 | 19-6 | 149-151 | Related to the expectation value, it is stated that " \bar{X} , is a measure of the center of its distribution" referring to the distribution of random variable X . For discrete distributions, this definition is problematic. Consider for example a random variable X that takes on a value of 1 with probability p (where $0 < p < 1$) and takes on a value of 0 with probability $1-p$. In the case where $p=0.6$, $\bar{X} = 0.6(1) + 0.4(0) = 0.6$; a value not found among the values for X (only values of 0 or 1 can occur). Thus 0.6 does not represent the middle of the distribution for actual values taken on by X . |
| C594 | 19.2.2 | 19-6 | 149-151 | "Expectation" is used instead of "expectation value". It seems that expectation value would be more appropriate. |
| C595 | 19.2.2 | 19-7 | 160-162 | The definition for the "probability density function" as presented seems to exclude discrete distributions. The presented definition also does not help with distributions that cannot be adequately characterized using formal mathematical expressions (e.g. formal distribution functions such as normal and lognormal). It would be helpful to add a general definition of the "probability density" as it relates to discrete and continuous random variables. It would also be helpful to add definitions of unimodal and multimodal distributions. |
| C596 | 19.2.2 | 19-7 | 165-166 | Random variable is defined as follows: "A random variable is the numerical outcome of an experiment which produces varying results when repeated." Random variables are not restricted to experiments. |
| C597 | 19.3.1, 19.3.2 | 19-8 | 181-237 | Edit sections 19.3.1 and 19.3.2 for brevity and clarity |
| C598 | 19.3.3 | 19-10 | 261 | Type A and B: all that is not A is B - nice definition. For type B you make a best guess? |
| C599 | 19.3.3 | 19-10 | 241 ff | I don't fully appreciate the difference between u and σ . Is the point that the uncertainty u describes your lack of confidence in a specific measurement while σ describes the variability of the measurement process? Perhaps a few more words on this point. |
| C600 | 19.3.8 | 19-13 | 333-334 | I've always been a bit uncomfortable about the notation $y \pm u$ for environmental measurements. It seems to imply a symmetric distribution, where the probability of an outcome less than $y-u$ is exactly the same as the probability of an outcome more than $y+u$. But that doesn't hold for asymmetric distributions, does it? Although I know I am battling decades or even centuries of tradition, maybe we should ask for a little more explanation. |
| C601 | 19.4.2 | 19-19 | 521 ff | I continue to find the issue of the MDC vs. the critical value difficult to understand intuitively. For example, I don't understand why the distribution on the right of Figure 19.3 shows more dispersion than the one on the left. I still struggle with the difference between the critical value and the MDC, although I do understand that the former is based on α and the other on β . It might be clearer to say (if true!) that the critical value is more important when the null hypothesis is that the sample is not contaminated, while the MDC is more important when the null hypothesis is the opposite. |
| C602 | 19 | 19 | | Another relatively powerful test for normality is discussed in: Dallal, G.E. and L. Wilkinson. 1986. An analytic approximation to the distribution of Lilliefors test statistic for normality. American Statistician. 40: 294-296 |
| C603 | 19 | 19 | | Overall impression of Chapter 19 main body - it is idiosyncratic. That is, it goes into great detail on stuff that may or may |

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| | | | | not be important and uses very general forms of equations that may not apply to the real world. A lot of effort goes into "uncertainty" calculations - but unless we assume normality it is hard to see what to do with the results. I'd like to see it start with counting statistics (page 19-44) and then proceed through a series of problems that treat typical or important cases, with generalizations left to footnotes or appendices. |
| C604 | 19.4.2 | 19-20, 19-22 | | Not real clear. What they want to say is that if the true analyte concentration is zero or "background," then counts greater or equal to X_c will be observed with probability $(1-\alpha)$. The minimum detectable value X_d is that amount of analyte which will yield a measurement less than X_c with probability β or less. If this is right (I'm pretty sure it is), then these three pages are way too long. |
| C605 | 19.4.3 | 19-22 | 587-615 | Do we really need to know about ISO versus IUPAC? This seems to beg for an appendix. |
| C606 | 19.4.6 | 19-25 | 670 | One good idea that deserves expansion is putting important points in bulleted form in boxes. The box on the top of page 19-25 is a good example. It is, however, critical that these boxed "important points" be as clear as possible. That is, the box on 19-25 states: "A measurement result should not be compared to the minimum detectable concentration to make an analyte detection decision. A detection decision may be made by comparing the gross signal, net signal, or measured analyte concentration to its corresponding critical value." This is an important recommendation that should be illustrated at this point by an example. |
| C607 | 19.5.2.2 | 19-31 | 810 | Why is Equation 19.8 needed? If the distribution is uniform, a probability interval $(1-\alpha)$ is defined by $2a \times (1-\alpha)$. |
| C608 | 19.5 | 19-33 | 847 ff | Equation (19.11) on page 19-33, for combined standard uncertainty, is only an approximation, not an equality. Admittedly, the text does state that "the variance of y is <i>estimated</i> using the [uncertainty propagation] formula" (emphasis added), but the presentation on this page does not clearly stress that the formula is an approximation, nor does it indicate the conditions under which this approximation would tend to be valid. In fact, both the use of an equal sign in Equation (19.11) and the use of terminology such as "the uncertainty propagation formula" or the "law of propagation of uncertainty" give the impression that the relationship in Equation (19.11) is an equality rather than an approximation. The report eventually clarifies the situation somewhat on page 19-38, where it states, "The formula is derived from a linear approximation of f (i.e., a first-order Taylor polynomial)." However, the report should state this whenever the formula is first introduced. |
| C609 | 19.5.3 | 19-35 | 874 | Looks like more appendix material. Would most users have a clue about the example? Moreover, is the resulting uncertainty useful? That is, is the result normal? If not what do we do with a variance or standard error? |
| C610 | 19.5.5.1 | 19-38, 19-39 | | Why? What are they trying to say? Is it important? Will anybody use it? What problem does it solve? |
| C611 | 19.6.2 | 19-44 | 1040 | It is important to get the most important material in at the start. For example, there is a nice discussion of counting statistics starting on page 19-44. This should be at or near the start of Chapter 19. |
| C612 | 19.6.2 | 19-46 | 1084 ff | If it is clearly Poisson with a low mean, the distribution is skewed; what's the point in estimating the standard deviation? |
| C613 | 19.6.5 | 19-52 | 1219 | What do we mean by "counting efficiency"? I assume it is the number of particles detected over the number actually emitted, right? |
| C614 | 19.6.9 | 19-58, 19-59 | | On pipettes etc, how often is this material (the math) actually used? |
| C615 | 19D.2 | 19-121 | 2557 | The example on Page 19-121 is an exact duplicate of the one on page 19-69, line 1634. Throughout the chapter, it would be helpful to number the examples to avoid duplication and facilitate reference in the text. |
| C616 | 19E | 19-135 | | Section 19E needs to be brought forward |

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| C617 | 19F | 19-149 | | On a technical note, for normality testing the authors might want to look at: Looney, S.W. and T.R. Gullledge. 1985. Use of the Correlation Coefficient with Normal Probability Plots. American Statistician. 39: 75-79. This is an update of the earlier paper they discuss in goodness of fit testing. |
| C618 | 19 | 19-1 | | Most of the material on the subject of “measurement statistics” is contained in Chapter 19. This Chapter starts out with a very clear presentation, and with very clear recommendations and examples. However, the clear recommendations and examples fade later in the chapter, just when the material becomes more difficult and when clear recommendations and examples are needed. |
| C619 | 19 | 19-1 | | In some cases the material appears to be arcane and takes on the appearance of material written by a bunch of statisticians with no reality checks by persons who work in radiochemical laboratories. One of the things that strikes me as unchecked against reality is the indication that a correction for buoyancy is needed when weighing material on a laboratory scale. There are other examples of details included in the material that appear to be unrealistic in terms of having any real impact upon measurement uncertainty. At the same time other sources of uncertainty, especially those that cannot be defined ahead of time, are not treated well. |
| C620 | 19 | 19 | | Lower case p is used for parameter, percentile, and probability at various points. You could consider other choices that would reduce the potential for confusion, such as Greek letters for parameters, Roman letters for estimators, and pr for probability. |
| C621 | 19 | 19 | | The general impression of our team was that the technical presentation, while statistically sound, might be too complex for the target audience of lab directors and staff. We have several suggestions that might help to make this chapter and several of the appendices more understandable to non-statisticians. |
| C622 | 19 | 19 | | Overall the reviewers feel that there is too much material for one chapter in chapter 19. We suggest dividing the chapter into two sections, one on measurement, detection and quantification, the other on uncertainty evaluation and expression. |
| C623 | 19 | All | | Essentially all of Chapter 19 is devoted to the use of “a priori” data; further, the name Bayes is mentioned only once. It seems to me that, in reality, there can be many sources of uncertainty in analytical procedures that are not recognizable in advance and cannot be quantified using the material in Chapter 19. Thus, it is perhaps more realistic to use “a posteriori” data and Bayes Rule to derive realistic limits of minimum detection, etc. This has been the subject of recent literature; the absence of any information on this technique is a serious omission in MARLAP. |
| C624 | 19C | 19-105 | | Eliminate or revise attachment 19C on coverage factors. As currently written, it is doubtful that anyone without a Ph.D. in statistics with experience in laboratory uncertainty analysis could implement this methodology. |
| C625 | 19D | 19-109 | | Revise attachment 19D to explain when someone should consider formulas A, B, and C, the Stapleton approximation, or the exact test. Does MARLAP have a preferred method? If so, it should be clearly stated, along with recommendations for situations when one of the other methods is preferable. |
| C626 | 19D | 19-109 | | Attachment 19D has a lot of interesting material on “Low-Background Detection Limits.” This is interesting, but there are many options given on how to calculate the detection limits, and no recommendations are given. This is a specific example of where recommendations would have been useful. |
| C627 | 19.3.8 | 19-13 | 357-360 | I am not entirely comfortable with the recommendation on page 19-13 that laboratories should report negative values when they are obtained, even if physically impossible. I understand the rationale for this, i.e., that laboratories should provide as much information as possible (to allow a complete evaluation), rather than censoring their results. However, reporting of physically impossible negative values can also be confusing. This is one of the advantages of Bayesian statistics, namely, with a non-negative prior distribution, one can ensure that the posterior distribution will take on only non-negative values. I do not have any strong ideas about how to solve this problem, since I realize that there are many |

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| | | | | obstacles to adoption of Bayesian analysis for these purposes, but just wanted to point out my discomfort. One way around the situation might be to recommend that labs report negative values when obtained, but clearly state that they are physically impossible, and provide guidance for how they should be interpreted, e.g., "the presence of negative values indicates that the uncertainties in the measurement are large relative to the amount of radioactivity, if any." This may help to reduce the likelihood of misinterpretation by users of laboratory results without much knowledge of statistics or radioactivity. |
| C628 | 19.3.10 | 19-15 | 386-442 | Much of the terminology for measurement uncertainty presented in Section 19.3.10 (e.g., "standard uncertainty," "expanded uncertainty," "coverage factor," "Type A," "Type B") seems non-standard and confusing to me. For example, "standard deviation" seems clearer than "standard uncertainty"; "upper and lower confidence limits" seems clearer to me than "expanded uncertainty" (which somehow gives the impression that the uncertainty has been exaggerated, or expanded beyond its actual measured extent!); and "subjectivist and classical statistical methods" seems clearer to me than "Type B and A evaluations." However, I recognize that the terminology used here may be standard in metrology, which is not my field |
| C629 | 19.3.10 | 19-15 | 386-442 | A simple figure or example accompanying this list of definitions would help the reader to understand the nuances among the different terms used for measurements, estimates, errors, and uncertainties. For example, describe the analysis for a soil sample associated with a site cleanup. Different types of measurements and estimates associated with the results could include the following: raw counts/minute (measurand and input estimate) and sample weight (measurand and input estimate), leading to a calculated sample activity in cpm/g (input quantity), and associated dose estimate (output quantity). A list of the potential errors associated with the dose estimate could include (a) counting error? (the definition on lines 391-392 is a bit ambiguous about whether or not this term is to be used), and (b) measurement error, which includes (b1) spurious error, due to (b1a) random error, (b1b) malfunction, or (b1c) similar types of events, as well as (b2) systematic errors. The example should include specific and realistic descriptions and numerical values for each one of these types of errors and for the uncertainties associated with each one, and then calculate the standard, combined, expanded, and total propagated uncertainties, along with the relative uncertainty for at least one of these categories. |
| C630 | 19.4.1 | 19-18 | 492-493 | Page 19-18 states, "The significance level α is usually chosen to be 0.05." This is certainly a true statement, and if laboratories are going to choose a significance level on their own (e.g., because the customer for the test does not specify a significance level), that is the value I would want them to use. However, sophisticated users of laboratory services may occasionally want to specify another significance level, because of the relative importance of type I versus type II errors. For example, in some situations, it may be particularly important to detect contamination if it is present, in which case a user may be willing to accept a higher significance level than 0.05. The report should perhaps note that fact. |
| C631 | 19.4.1 | 19-18 | 497-500 | The report defines the term "blank" informally at the bottom of page 19-18, but it should also be included in the summary of terms related to detection and quantification capability in Section 19.4.7. The discussion may also need to be expanded and clarified, as the report uses a variety of terms, such as "blank signal," "instrument blank," "blank measurement," "blank material," "blank count," and the like. I had to figure some of them out from context, and the definitions may not always be clear to people who are not familiar with the terms. For example, some readers could misinterpret a "blank count" as referring to an observed count of zero (e.g., no radioactivity detected), rather than a count from a sample that contains none of the substance being analyzed (whether zero or not). |
| C632 | 19.5.2.1 | 19-30 | 790-797 | On page 19-30, Section 19.5.2.1 discusses the computation of experimental covariance for evaluations of Type A. However, Section 19.5.2.2 contains no comparable discussion of covariance for Type B evaluations. I recognize that estimating covariance or correlation subjectively is an extremely difficult task. However, if correlation is important |

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| | | | | enough to be worth discussing for evaluations of Type A, it is presumably also important for Type B evaluations. One good reference on the subject is "Assessing Dependence: Some Experimental Results," by R. Clemen, R. Winkler, and G. Fischer, Management Science, 46 (2000), 1100-1115. |
| C633 | 19.5.3 | 19-33 | 848-856 | Equation (19.11) on page 19-33, for combined standard uncertainty, is only an approximation, not equality. The report eventually admits this on page 19-38, which says, "The formula is derived from a linear approximation of f (i.e., a first-order Taylor polynomial)." Therefore, it is exact only for simple additive functions (or for multiplicative functions when the factors are independent). In other cases, the analyst would need to know the entire distribution of the input variables (not merely their standard deviations) to find the standard deviation of the result. When the first-order Taylor polynomial is not sufficiently accurate, analysts can use Monte Carlo simulation to propagate uncertainty. The report should probably note this (at least in a footnote), preferably with one or more references. Admittedly, when uncertainties are small, the errors associated with the first-order Taylor polynomial are likely to be small. However, the report should clearly state that the formula is an approximation when it is first introduced, and the terminology "law of propagation of uncertainty" should be avoided if possible. I also strongly recommend using an "approximately equal" sign instead of an equality sign to avoid confusion |
| C634 | 19.5 | All | | The discussion of uncertainty propagation in subsections 19.5.3 (Combined Standard Uncertainty), 19.5.5.1 (uncertainty propagation for nonlinear models), and 19.5.5.2 (Bias) is both incomplete and potentially misleading. In particular, the methods presented are only approximate, but this is not always clearly stated. The report also does not give references to approaches that would be more generally applicable when the approximate methods presented here are not appropriate. |
| C635 | 19.5 | All | | Similar problems of notation (presenting approximations as equalities) appear throughout Section 19. Admittedly, when uncertainties are small, the errors associated with the first-order Taylor polynomial are likely to be small. However, the report should clearly state that the formula is an approximation when it is first introduced, and misleading notation and terminology (such as referring to the formula as the "law of propagation of uncertainty") should be avoided if possible |
| C636 | 19.5.3 | 19-34 | | It would also be helpful if the terminology and notation clearly indicated (both in these subsections and throughout Section 19) the approximate nature of most of the calculations. To give an indication of the nature of the problem, consider Table 19.1, which presents applications of the uncertainty propagation formula to various mathematical expressions. The table shows all of the results as equalities, even though the uncertainty propagation formula is only approximate for all applications shown in the table except to sums and difference. By contrast, in the last row, the table uses an "approximately equal" sign to indicate that $(\ln 10)^2$ is only <i>approximately</i> equal to 5.302. This latter result is at least accurate to four significant figures, while in some cases, the results presented as equalities might not be accurate to even a <i>single</i> significant figure! |
| C637 | 19.5 | 19-35 | 783-1023 | I agree with Rick Hornung's observation that in the examples presented here, "the uncertainties for each of the input parameters ... are already provided." In my view, this is a serious shortcoming. Methods for subjectivist (i.e., Type B) evaluations of uncertainty are a whole subfield of Bayesian statistics and decision analysis; I can provide some references on request. |
| C638 | 19.5 | 19-35 | 783-1023 | The examples in this section also all involve extremely small uncertainties. These may well be representative of the uncertainties arising from lab work, but that is not clear, and someone knowledgeable about radiological laboratory measurement should assess the reasonableness of the uncertainty estimates used in the examples. My own personal suspicion is that while statistical uncertainties (e.g., variability between replications of the same measurement) may tend to be small, that will not always be the case (e.g., with poor laboratory procedure). More significantly, I would expect that systematic error (or "bias" -- for example, due to use of inappropriate laboratory methods, contamination of samples, etc.) |

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| | | | | would tend to be much larger than statistical variability, and probably larger than the uncertainties given in many of the examples in this section. |
| C639 | 19.5.3 | 19-35 | 874-904 | Similar to the case for Equation 19.11, the example on page 19-35 appears to compute the output estimate A as a function of the mean values of the various input parameters. Again, this is an approximation based on a first-order Taylor polynomial. In fact, assuming that the mean of a function is equal to the function of the mean is one of the most common and most serious fallacies of novices in probability. This is acknowledged only several pages later (on page 19-40), and in a rather roundabout way (i.e., "If f is nonlinear, its nonlinearity may also tend to bias the output estimate y"). This vague explanation may lead to confusion about the use of the term "bias" on page 19-41. As before, the report should clearly state that the formula is an approximation when it is first introduced, and I would recommend using an "approximately equal" sign instead of an equality sign here (and throughout the report, when presenting approximations). |
| C640 | 19.5 | All | | Experience in situations where the uncertainties are substantial has made some committee members leery of first order error propagation. When uncertainties are large and it is important to have a good estimate of their magnitude, it is preferable in our view to develop a good description of the process generating the uncertainty and the error distributions involved, and then do a Monte Carlo analysis. In Section 19.5.5.1, the report does show how to include higher-order terms in the uncertainty propagation formula. However, the version of the uncertainty propagation formula presented in this subsection assumes that "all the input estimates $x_{\{sub i\}}$ are uncorrelated," and no mention is made of Monte Carlo simulation as an alternative to the uncertainty propagation formula when uncertainties are substantial and the approximations given here are not valid. |
| C641 | 19.5.5 | All | | Even a second order Taylor polynomial can be inaccurate when uncertainties are large and the function of interest exhibits significant nonlinearities. In such cases, the analyst needs to know the entire distribution of the input variables (not merely their marginal variances) to find the variance of the result. Analysts can use Monte Carlo simulation to propagate uncertainty in such cases, and in principle can achieve any desired level of accuracy by increasing the number of simulation replications. The report should note this (at least in a footnote or an appendix), and should provide one or more references. In fact, the discussion of second order Taylor polynomials could also go in an appendix, and in any case second order Taylor polynomials should not be featured more prominently in the discussion of uncertainty analysis than Monte Carlo simulation. |
| C642 | 19.5.5.2 | All | | Section 19.5.5.2 claims to be a discussion of bias. However, this section does not seem to be using the term in the usual statistical sense, as discussed on pages 19-5 and 19-6, but rather refers to the potential inaccuracy of the Taylor polynomial approximation. Moreover, the estimate of bias given by Equation (19.18) appears to be itself a Taylor polynomial approximation. Rather than providing an estimate of the bias from use of the Taylor polynomial, the committee would prefer a qualitative discussion of situations in which this approximation is not accurate (e.g., when the uncertainties span a range sufficiently large that the function of interest is not approximately linear over that range). The report should also recommend the use of Monte Carlo simulation in such cases. |
| C643 | 19B | 19-97 | | Appendix 19B should be eliminated. |
| C644 | 19B | 19-97 | | It seems to me that some of the potentially most useful information relates to the use of vectors and matrices to examine larger bodies of data and to use least-squares approaches. However, this material is not well developed; specifically, a good example of these techniques should be given. |
| C645 | 20 | All | | Should a reference be made as to where the CFRs are to be found? |
| C646 | 20 | All | | I am impressed with the Chapter. However, I must add that I am not an expert in Waste Management. The Chapter has good flow. The second paragraph in the introduction is a nice road map that tells what the Chapter is all about. The |

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| | | | | Chapter, out of necessity, gives general guidelines and then lists specific references to lead readers to areas for more detailed information. |
| C647 | 20 | All | | Hyphens. The new rule with regard to hyphens is to use fewer of them, especially on "non" words. Therefore, I recommend taking out the hyphens of the following words: nonradioactive (lines 28, 92, 93, 97, 145, 152, 153), multiservice (line 26), degreasers (Table 20.1, row 3), biphenyls (Table 20.1, row 14), nonhazardous (lines 123, 137), microscale (line 130), reuse (line 140) |
| C648 | 20.6.1 | 20-10 | 275 | should this be rewritten since October 2001 has passed? |
| C649 | 20.6.2.4 | 20-12 | 337 | Think you mean "airborne radioactivity", not "radiation". |
| C650 | 20.8 | 20-16 | 451 | The section, 20.8, Useful Web Sites, is an excellent addition to the Chapter. (However, just before final publication someone should check all of them to be sure they are all correct and active.) |
| C651 | | All | | The appendices are inconsistent in how sections are numbered: e.g., A.12.6, D2.6 |
| C652 | | All | | There is not adequate advice to laboratories on how they check their own data Chapter 7.3 and 7.4 and tie in Chapter 17 with Chapter 8, 9. Consumer advice is present on how to verify and validate data, but no parallel advice to labs on how to check their own data. Verification is possible but not validation. What advice do we give to the lab to verify data? Set up Quality Assurance and/or Quality Control and reporting format criteria. Page 17.39 talks about data packages. |
| C653 | | All | | Another potential problem is that many of the manual's chapters are written as if directed toward project managers in the sponsoring organization, while others are written as if directed toward the laboratory personnel, cautioning them about mistakes the sponsors could make (e.g., Chapter 11). |
| C654 | | All | | The document would benefit from an index |
| C655 | | All | | Use of traditional units in parentheses is uneven - RAC should decide to recommend this practice, or not, and then suggest that use or no-use be applied uniformly |
| C656 | | All | | Use the same reference format throughout the text. |
| C657 | | All | | Sometimes text is too specific and as the information is often not complete anyway, and it is stated in the MARLAP document that the intention is not to provide guidance in sampling, there should be some rewrite. |
| C658 | | All | | Throughout the document, the words radioactivity or isotope(s) are used when radionuclide(s) is the appropriate term. |
| C659 | B3.1 | B-4 | 96 | The recommendation to show a "site conceptual model" presumes that the decision relates to the remediation of a site, which isn't always the case. Maybe add "and appropriate" after "possible". Also, at the end of this subsection it might be useful to add an example "concise description". |
| C660 | B3.3 | B-6 | 155 | Remove "compatible" or "in complete agreement". |
| C661 | B3.6 | B-9 | 247 | "exits" should be "exist". Also, I would prefer a more concrete example of the decision rule. |
| C662 | B3.7 | B-9 | 258 | Might follow this sentence with a cross reference to B-1.4, where the choice of the null hypothesis is discussed. |
| C663 | B3.7 | B-10 | 298-299 | Is it an "action limit" or "action level"? |
| C664 | B3.8 | B-12 | 347-554 | Same comment as for section 2.5.4, lines 475-482. This is a good place to point out that it may be more important and useful to obtain lots of data of only modest quality (e.g., $\pm 30\%$) rather than few samples of very high quality (e.g., $\pm 1\%$). For example, screening for hot spots, collecting reconnaissance data from an area about which little is known, collecting water samples for radon analyses under conditions for which where it is known or suspected that the sample may outgas highly, collecting data for a purpose for which a precise method not needed, and when field sampling uncertainties may overwhelm analytical uncertainties. |
| C665 | B-1.4 | B-18 | 507-508 | I don't see why the project planning team is more likely to discover a mistake in a high reading than a low one if they are indeed wedded to a null hypothesis that contamination exists. |

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| C666 | B-1.6 | B-21 | 606 | It is easy to read this section as saying that one defines the gray region in terms of the MDC. I think it is really the other way around, as suggested in Appendix C: One uses the decision parameters to define the gray region and then calculate what MDC is needed to support it. Maybe a cross reference to Appendix C here. |
| C667 | C.3 | C-4 | 97 | It was not entirely clear to me whether the sigma squared sub s here is the variance of the distribution or the variance on the mean of the distribution. I suspect that it is the latter because the decision regards the sample mean. In any event, some clarification is in order. |
| C668 | C.3 | C-4 | 110 | It is not clear to me that one CAN control sigma sub s. The statement would still be true, but is "easier" the right word? What did the writer have in mind? |
| C669 | C.3 | C-5 | 140-146 | Same comment as for section 2.5.4, lines 475-482. This is a good place to point out that it may be more important and useful to obtain lots of data of only modest quality (e.g., $\pm 30\%$) rather than few samples of very high quality (e.g., $\pm 1\%$). For example, screening for hot spots, collecting reconnaissance data from an area about which little is known, collecting water samples for radon analyses under conditions for which where it is known or suspected that the sample may outgas highly, collecting data for a purpose for which a precise method not needed, and when field sampling uncertainties may overwhelm analytical uncertainties. |
| C670 | D2.7.1 | D-13 | 366 | According to your convention, shouldn't "false positive" be "Type II error"? |
| C671 | F | All | | This appendix is thought-provoking and is a step toward quantifying uncertainty in sub-sampling, despite the disclaimers. |
| C672 | F.3.2 | F-6 | 152-159 | Sections of Chapter 12, which have more detailed descriptions of equipment used to mix and grind solid samples and methods for decontamination should be cross-referenced from here. |
| C673 | G | G-1 | | The table of contents indicates that a glossary will be provided. As this is being done, it may be useful to place in bold font, terms in each definition that are further defined in the glossary. |
| C674 | | All | | The boxed Summaries of Recommendations seemed useful and easy to understand. However, it was not clear to me whether there were too few of them relative to the large amount of detail given in each chapter. |
| C675 | | All | | Overall, Chapters 10-18 and 20 and the associated appendixes represent an enormous effort and supply a vast amount of information on radioanalytic laboratory procedures in support of environmental health decisions. No important area of concern appears to me to have been overlooked. The advice given is well supported by extensive citations to the scientific literature and bibliographic compilations of related documents and sources. The chapters are generally well organized and the exposition is generally clear; typographic and grammatical errors are minimal. Whatever concerns I have about these chapters tend to be minor, and I consider none to be fatal. |
| C676 | | All | | I am somewhat concerned that some of the chapters may not be as usable and user-friendly as others. Contrast, for example, Chapter 18 on Laboratory Quality Control with Chapters 13-15 on the details of laboratory procedures. Chapter 18 is quite specific in its advice for maintaining quality through performance indicators, and maintains a consistent format for describing each indicator. Chapters 13-15, especially 15, tend to be more encyclopedic and descriptive, without as much clearcut advice. Although I understand that the MARLAP team deliberately avoided making specific recommendations for choice of analytic procedure, a choice that I support, I wonder whether a laboratory tasked with analyzing a specific set of samples will easily find the information it needs in these comprehensive chapters. Perhaps what is needed is a section on "how to use this document" where a laboratory would find directions on how to find the critical information for its needs. For example, if it receives samples of soil thought to contain radium-226 and uranium 238 and 234 as nuclides of concern, along with suspected non-radioactive metals as well as some other nuclides that might cause interferences, and the soil is described as having likely having certain characteristics such as particle size distribution, moisture and organic content, pH, etc., then how do they find advice on how to prepare the samples, dissolve and separate |

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| | | | | them as necessary, and count or otherwise analyze them? What are the principal errors that are most likely for this kind of sample and analytes? |
| C677 | | All | | Many of the references to analytical methods appear to be old (1950s and 1960s). They may be valid and the best available information but it seems odd that there is not more recent information. |
| C678 | | All | | We suggest that Part II be divided into two volumes to facilitate convenient use in the laboratory. A reasonable separation may be between chapters 10 – 14 plus 20 and 15 – 19. The former chapters pertain mostly to chemistry and the latter, to radiation detection. |
| C679 | | All | | We suggest that the format for reporting environmental radionuclide data should depend on the end use of the data and the necessary transmission of information to the reader. Specifically, care should be taken in reporting radionuclide concentrations that are negative due to subtracting the radionuclide background, or are below the level of detection as determined from counting statistics. Such numbers should be reported for subsequent use in compiling or averaging the data, or for evaluating the reliability of measurements near the limits of detection. For use in describing environmental contamination to the public, the facility operator, and regulators, such numbers should be replaced by “less-than” values or a statement of non-detectability. |
| C680 | | All | | Cite the original reference for a method as the method is discussed instead of combining all references at the end of the subsection. |
| C681 | | All | | With respect to Charge Question # 3: As nearly as I can tell, the material is technically accurate. However, I think the material could be more clearly and usefully presented. Lacking a more clear presentation, I doubt that “appropriately trained personnel” can implement much of the material. |
| C682 | | all | | Another aspect that I believe to be very important is that of establishing criteria for the rejection of analytical results when samples are processed as batches. That is, criteria for when the entire batch of results should be rejected based upon information for quality control samples and blanks processed with a particular batch. This is a very important subject for contracting (Appendix E) and for laboratories themselves when processing batches of samples for, for example, the analysis of ^{239,240} Pu. I think this subject should be dealt with much more extensively. |

APPENDIX D—EDITORIAL REVIEW COMMENTS

| Row | Section | Page | Line | Editorial Review Comment |
|-----|--------------|--------|-----------|---|
| D1 | TOC | X | | Typo in title for section 2.5?: Should this be "Directed"? |
| D2 | List of figs | XLI | Fig. 14.4 | Missing first word of figure caption ("The") |
| D3 | List of figs | XLI | Fig. 14.1 | Figure 14.1 caption includes a mysterious superscripted number (1) |
| D4 | Acronyms | XLVII | | I like the format of this list, in which bracketed numbers indicate the first chapter in which the acronym appears. |
| D5 | Acronyms | XLVII | | Proposed additions to acronym list: parameter symbols, at least the most common ones (alpha, beta, del, sigma). Also ACE, Bq, NIM, MCL [2:289], GEDD [17:1031], E, U, Q, J, R [8:264-276] |
| D6 | Acronyms | XLVIII | | Check whether the I in ERPRIMS stands for anything (a logical guess would be "Information"). |
| D7 | Acronyms | XLVIII | | ESC actually first appears in Chapter 2, on page 2-5, lines 119-120 |
| D8 | Acronyms | XLVII | | I think some of the acronym definitions should probably be capitalized instead of all lower case. Examples: SAFER, ESC, DQO. Seems to be a bit arbitrary as to when an acronym's definition is capitalized and when it is not (e.g., SOW but not RFP or RFQ). |
| D9 | Acronyms | XLIX | | MDC actually first appears in Chapter 2, on page 2-16, line 451 |
| D10 | Acronyms | LI | | I suggest that the definition of TPP be followed by "[process] (ACE)" |
| D11 | 1.1 | 1-1 | 6 | Change "its" to "their" |
| D12 | 1.2 | 1-2 | 56 | Change "its" to "their" |
| D13 | 1.4.1 | 1-5 | Fig 1.1 | Note that QC, which appears in Fig 1.1, has not yet been defined for the reader at this point. |
| D14 | 1.4.1 | 1-5 | Fig 1.1 | The font in Fig. 1.1 is uncomfortably small for us post-40-yr-old readers. |
| D15 | 1.4.4 | 1-7 | 221 | Delete phrase, "It should be noted that" |
| D16 | 1.4.4 | 1-7 | 228 | Delete "for the various activities." |
| D17 | 1.4.4 | 1-7 | Fig 1.2 | Note that QA/QC, which appears in Fig 1.2, has not yet been defined for the reader at this point. |
| D18 | 1.4.4 | 1-7 | Fig 1.2 | The font in Fig. 1.2 is uncomfortably small for us post-40-yr-old readers. |
| D19 | 1.4.4 | 1-8 | 232 | Missing period |
| D20 | 1.4.5 | 1-8 | 237 | Delete "the relevant activities, such as" |
| D21 | 1.4.5 | 1-8 | 240-242 | Delete the sentence starting with "A written procedure..." This is an unnecessary detail. |
| D22 | 1.4.7 | 1-8 | 258-305 | This section was well-written. |
| D23 | 1.4.7 | 1-8 | 260 | Awkward wording: "generally the word always refers to..." Delete either "generally" or "always". |
| D24 | 1.4.7 | 1-9 | 276 | Typo: "expanded" |
| D25 | 1.4.7 | 1-9 | 292 | Replace "since" with "because". "Since" is used to refer to passage of time (although I know this rule of thumb is commonly ignored). |
| D26 | 1.4.7 | 1-10 | 301 | Replace "since" with "because". |
| D27 | 1.4.8 | 1-10 | 306 ff | This is a wonderful discussion on precision, bias, accuracy, uncertainty, etc. |
| D28 | 1.4.8 | 1-10 | 306-348 | This section was well-written. |
| D29 | 1.4.8 | 1-10 | 309 | Replace "since" with "because". |
| D30 | 1.4.8 | 1-10 | 323-324 | Delete "depending on one's point of view" |
| D31 | 1.4.8 | 1-10 | 324 | Correct section reference to "1.4.7" |
| D32 | 1.4.8 | 1-10 | 326-332 | Suggest deleting these last 3 sentences. They are a bit confusing and seem an unnecessary level of detail for this discussion. |
| D33 | 1.4.8 | 1-10 | 328 | Replace "is" with "are" |

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| D34 | 1.4.8 | 1-11 | 335 | Replace "since" with "because". |
| D35 | 1.4.9 | 1-11 | 352-354 | Replace semi-colons with commas. |
| D36 | 1.4.10 | 1-12 | 387 | Replace "since" with "because". |
| D37 | 1.4.10 | 1-12 | 387-389 | Delete the second half of this sentence because this is the subject of the following paragraph that starts on line 396; no need to state it twice. Deleted part: ", and since most projects require that a number of different analyses be performed, several APSs will normally be developed for a particular project." |
| D38 | 1.4.10 | 1-13 | 399-402 | Delete the sentence starting with "However, the level of specificity.." because this was discussed in the previous paragraph on lines 391-392. Move the following sentence about the one-page form to the end of the previous paragraph (line 395). Delete the last sentence; it's already been said. |
| D39 | 1.4.11 | 1-13 | 410-412 | Delete the first sentence, and replace "The" with "MARLAP's" in the second. |
| D40 | 1.4.11 | 1-13 | 416 | Delete left parenthesis |
| D41 | 1.4.11 | 1-13 | 417 | Missing period |
| D42 | 1.6.1 | 1-17 | 500 | Replace the last part of the first sentence so that it reads "an overview of the directed planning process and its outputs." |
| D43 | 1.6.2 | 1-18 | 550 | Need to correct the title listed for Chapter 10 |
| D44 | 1.6.2 | 1-19 | 550 | Need to correct the title listed for Chapter 10 |
| D45 | 1.6.3 | 1-19 | 578 | Delete "to both Part I and Part II of the manual" and replace "several" with "the following" |
| D46 | 1.6.3 | 1-19 | 579 | Delete the last sentence. |
| D47 | 1.6.3 | 1-19 | 583 | Replace "Data Quality Objectives" with "DQO" to match the title that appears in the Table of Contents and at the beginning of this Appendix |
| D48 | 1.6.3 | 1-19 | 587 | Should "select" be "selected"? |
| D49 | 1.6.3 | 1-19 | 588-594 | Note that the bullets for Appendices D through G don't describe their contents except by restating the titles; I suggest just listing the titles alone. |
| D50 | 1.7 | 1-20 | 605 | Couldn't get to the MARSSIM web site using this address. Replace "/filesfin.htm" with "/obtain.htm". Consider including in the reference list, the date when the web site was most recently confirmed as being accurate. |
| D51 | 1.7 | 1-20 | 607 | Capitalize the first letter in "Available". Verify the web site address. |
| D52 | 1.4.1 | 1-5 | Fig 1.1 | I liked this Figure 1.1 because it clearly presented the concept of a Data Life Cycle without a lot of words. |
| D53 | 2.1 | 2-1 | 11 | Replace "of" with "on"; replace "achieve" with "support" (to match the use of this word on line 4). |
| D54 | 2.1 | 2-1 | 13 | Refer to plural: "objectives" and "are" |
| D55 | 2.1 | 2-1 | 20 | Add some punctuation to this phrase, e.g. "...experts--in particular, radioanalytical specialists--in the planning..." |
| D56 | 2.1 | 2-1 | 24 | Spell out SOW |
| D57 | 2.1 | 2-1 | 25 | Delete "--DQA" |
| D58 | 2.1 | 2-1 | 26 | Use the present tense instead of the future tense by replacing "will use" with "uses". |
| D59 | 2.1 | 2-2 | 31-33 | Move the second sentence to the end of the paragraph. Delete the name of the referenced chapter; the chapter number alone is adequate. |
| D60 | 2.1 | 2-2 | 31-41 | Use the present tense instead of the future tense throughout this paragraph (i.e., delete the word "will") |
| D61 | 2.1 | 2-2 | 44 | Typo, should refer to Section 1.4.1, not 1.4.7 |
| D62 | 2.1 | 2-2 | 45-47 | Delete the parentheses and replace the left-hand parentheses with the word "because". |
| D63 | 2.2 | 2-3 | 75 | Insert comma after "stakeholders" |
| D64 | 2.2 | 2-3 | 81 | Define QC |
| D65 | 2.2 | 2-3 | 84 | Replace "is" with "are" |

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| D66 | 2.3.2 | 2-4 | 113-131 | The titles of these ASTM references are slightly different from those listed in the reference section, e.g., "Guide" on line 118 but "Guidance" on line 745; "Characteristics" on line 123 but "Characterization" on line 748; the word "for" following "Guide" on lines 747, 738, and 743 but missing from lines 123, 128, and 131; and the location of the procedure number with respect to the title. |
| D67 | 2.3.2 | 2-5 | 139, 142 | Need to indicate 2000a and 2000b to distinguish these two EPA references. |
| D68 | 2.3.2 | 2-5 | 143 | Acronym ACE used here; Chapter 4 uses "USACE" |
| D69 | 2.3.2 | 2-6 | 152 | Need to specify either 2000a or 2000b to identify which EPA reference is meant here |
| D70 | 2.3.3 | 2-6 | 176 | Insert "only": "If only a cursory job..." |
| D71 | 2.3.3 | 2-7 | 190-191 | I suggest deleting the name of the referenced chapter. The chapter number alone is adequate. |
| D72 | 2.4 | 2-7 | 195 | Insert commas: "who have a vested interest in, or who can influence, the outcome" |
| D73 | 2.5 | 2-9 | 252 | Typo in title for section 2.5?: Should this be "Directed"? |
| D74 | 2.5 | 2-9 | 263 | Insert "(APSS)" at end of sentence. |
| D75 | 2.5 | 2-10 | 276 | Replace "lab" with "laboratory" |
| D76 | 2.5 | 2-10 | 277 | Insert comma after "design" |
| D77 | 2.5 | 2-10 | 289 | Hyphenate "resource-effective" |
| D78 | 2.5 | 2-10 | Table 2.1 | Row 1, Column 3, bullet 2, line 3: replace "is" with "are" ["the underlying data that are..."] |
| D79 | 2.5 | 2-11 | Table 2.1 | Row 2a, Column 3, bullet 1, line 2: insert comma after "measured" |
| D80 | 2.5 | 2-11 | Table 2.1 | Row 2b, Column 2, last line: replace "is" with "are" ["if new data are needed"] |
| D81 | 2.5 | 2-11 | Table 2.1 | Row 2b, Column 4, bullet 4, line 1: delete premature period |
| D82 | 2.5 | 2-11 | Table 2.1 | Row 3a, Column 3: make the format of these bullets consistent with other entries in this column: "Identify potentially..." and "Estimate measurement uncertainties..." Note that "uncertainties" should be plural here because "protocols" is plural. |
| D83 | 2.5 | 2-11 | Table 2.1 | Row 3b, Column 3, bullet 2, line 4: Insert comma after "protocols" and insert "if" after "or": "protocols, or if the..." |
| D84 | 2.5 | 2-11 | Table 2.1 | Row 3b, Column 4, bullet 2, line 1: Replace "Define" with "Definition of" |
| D85 | 2.5.1 | 2-12 | 347 | Replace ""making a decision" with "needing a decision to be made" |
| D86 | 2.5 | 2-12 | Table 2.1 | Row 4, Column 1: Use lower case for all words but the first one, to match format of the other rows in this column. |
| D87 | 2.5 | 2-12 | Table 2.1 | Row 4, Column 3, bullet 3, line 1: would read more smoothly if "Method requirement" were replaced by "Methods required" |
| D88 | 2.5 | 2-12 | Table 2.1 | Row 4, Column 3, bullet 6, line 1: replace "quality control" with "QC" |
| D89 | 2.5 | 2-12 | Table 2.1 | Row 4, Column 3, bullet 9, line 2: Replace "Analytical Protocol Specifications" with "APSS" |
| D90 | 2.5 | 2-12 | Table 2.1 | Row 4, Column 4, bullet 3: Replace "Analytical Protocol Specifications" with "APSS" |
| D91 | 2.5.1 | 2-13 | 354 | Replace "projects's" with "project's" |
| D92 | 2.5.2.1 | 2-13 | 378 | Replace "criteria" with "criterion" to match rest of the list in this sentence |
| D93 | 2.5.2.1 | 2-13 | 379 | Replace "the type of medium" with "a specific type of medium" |
| D94 | 2.5.2.1 | 2-14 | 388 | Delete "probably". Insert hyphen in "radionuclide-specific" |
| D95 | 2.5.2.1 | 2-14 | 389 | Insert "(MCL)" after "Maximum Contaminant Level" (and add it to the list of acronyms) |
| D96 | 2.5.2.1 | 2-14 | 393 | Delete "of the directed planning process" |
| D97 | 2.5.2.1 | 2-14 | 398 | Delete "of Chapter 3" |
| D98 | 2.5.2.1 | 2-14 | 400 | Replace "Analytical Protocol Specifications" with "APSS" |
| D99 | 2.5.2.2 | 2-14 | 402 | Reverse order of words: "team should define clearly..." |

| Row | Section | Page | Line | Editorial Review Comment |
|------|---------|------|---------|--|
| D100 | 2.5.2.2 | 2-14 | 403-404 | Replace "The scale" with "The spatial and temporal boundaries" and delete "based on the spatial and temporal boundaries" |
| D101 | 2.5.2.2 | 2-14 | 407 | Insert comma after "shape" |
| D102 | 2.5.2.3 | 2-15 | 423 | Delete "(e.g., mean concentration)"; repetitive of its appearance on line 418 |
| D103 | 2.5.2.3 | 2-15 | 423 | Insert "statistical" after "appropriate" |
| D104 | 2.5.2.4 | 2-15 | 425-426 | The second half of this sentence would read more smoothly if it were revised to read, "...a list of the specific data requirements (number, type, quality)." |
| D105 | 2.5.3 | 2-15 | 444 | Change the colon to a semi-colon |
| D106 | 2.5.3 | 2-15 | 444 | Replace "will" with "must" |
| D107 | 2.5.3 | 2-16 | 445-446 | I suggest deleting the name of the referenced chapter. The chapter number alone is adequate. |
| D108 | 2.5.3 | 2-16 | 457 | Replace "decisions" with "decision" |
| D109 | 2.5.3 | 2-16 | 458 | Capitalize the first letter in "See" |
| D110 | 2.5.3 | 2-16 | 460 | Should it be "maker's" instead of "makers' "? I've seen it both ways in this chapter (e.g., maker in row 1, column 4 of Table 2.1 and on line 722) |
| D111 | 2.5.3 | 2-16 | 464 | Replace "Type I or Type II" with "decision" |
| D112 | 2.5.4 | 2-17 | 476 | Insert "and" after "number of samples required" |
| D113 | 2.5.4 | 2-17 | 476 | Replace "Analytical Protocol Specifications" with "APSs" |
| D114 | 2.5.4 | 2-17 | 477-479 | Replace the long parenthetical reference with a shortened version: "(see sections 2.5.4.1 and 2.5.4.2 below)" |
| D115 | 2.5.4 | 2-17 | 496 | The sentence would read more smoothly by shifting the location of "which" and deleting the comma: "to identify which portions of the analytical protocols potentially have..." |
| D116 | 2.5.4.1 | 2-18 | 507-508 | I suggest deleting the name of the referenced chapter. The chapter number alone is adequate. |
| D117 | 2.5.4.2 | 2-18 | 526 | Replace "lab" with "laboratory" |
| D118 | 2.5.4.2 | 2-18 | 533 | Should "select" be "selected"? |
| D119 | 2.5.4.2 | 2-18 | 535 | Insert apostrophe in "analyte's" |
| D120 | 2.5.4.2 | 2-19 | 542 | Replace "Appendix D, Section 2.7" with "Appendix Section D2.7" |
| D121 | 2.6 | 2-19 | 544-545 | Replace "their priority of concerns" with "its prioritized concerns" |
| D122 | 2.6 | 2-19 | 547 | Replace "They have" with "It has" |
| D123 | 2.6 | 2-19 | 556 | Should the order be reversed to "a decision and an action"? |
| D124 | 2.6.1 | 2-20 | 569-570 | Replace "Analytical Protocol Specifications" with "APSs" |
| D125 | 2.6.1 | 2-20 | 571 | Insert comma after "data" |
| D126 | 2.6.1 | 2-20 | 582 | Replace "Analytical Protocol Specifications" with "APSs" in 2 places on this line |
| D127 | 2.6.1 | 2-20 | 585-586 | Replace "Analytical Protocol Specifications" with "APSs" |
| D128 | 2.6.1 | 2-20 | 587-588 | I suggest deleting the name of the referenced chapter. The chapter number alone is adequate. |
| D129 | 2.6.1 | 2-20 | 589 | Replace "Analytical Protocol Specifications" with "APSs" |
| D130 | 2.6.2 | 2-21 | 605 | Replace "lab" with "laboratory" |
| D131 | 2.7.1 | 2-22 | 602-603 | Replace "Analytical Protocol Specifications" with "APSs" |
| D132 | 2.7.1 | 2-22 | 633 | Insert "statistical", i.e. "the stastical parameter" |
| D133 | 2.7.1 | 2-22 | 642-643 | I suggest deleting the name of the referenced chapter and appendix. The chapter number and appendix letter alone are adequate. |
| D134 | 2.7.2 | 2-22 | 655 | Delete comma after "agreement" |

| Row | Section | Page | Line | Editorial Review Comment |
|------|---------|------|----------|--|
| D135 | 2.7.2 | 2-22 | 659 | Replace "labs" with "laboratories" |
| D136 | 2.7.3 | 2-23 | 678 | Delete comma after "as well as" |
| D137 | 2.7.4.1 | 2-24 | 709-710 | I suggest deleting the name of the chapter. The chapter number is sufficient. |
| D138 | 2.7.4.2 | 2-24 | 714-715 | I suggest deleting the name of the chapter. The chapter number is sufficient. |
| D139 | 2.7.4.2 | 2-24 | 716 | Delete "planning process statements of the" |
| D140 | 2.7.4.3 | 2-24 | 723 | Use lower case for "DQA process" because it is lower case elsewhere in this paragraph |
| D141 | 2.7.4.3 | 2-24 | 724 | I suggest deleting the name of the chapter. The chapter number is sufficient. |
| D142 | 2.7.4.3 | 2-24 | 725 | Insert "the" in "the DQA process" |
| D143 | 2.8 | 2-26 | 762, 767 | Need to indicate 2000a and 2000b to distinguish these two EPA references. |
| D144 | 3.1 | 3-1 | 14 | Replace "only should contain" with "should contain only" |
| D145 | 3.1 | 3-1 | 16-19 | Delete the last two sentences because they repeat concepts already stated in the previous paragraph. |
| D146 | 3.1 | 3-1 | 20 | Delete the word "key" here. |
| D147 | 3.2 | 3-2 | 42 | replace semi-colons with commas |
| D148 | 3.2 | 3-2 | 44 | Delete sentence "Figure 3.1..." |
| D149 | 3.2 | 3-2 | 48 | Insert comma: "planning issues, depending" |
| D150 | 3.3 | 3-2 | 56 | Delete "of Chapter 6" because this is self-evident from the section number |
| D151 | 3.3.1 | 3-5 | 112 | Line 113 belongs in the same paragraph as the sentence that precedes it ("Gross alpha...studies.") Either append it to the preceding paragraph, or use the preceding sentence as the start of a new paragraph. |
| D152 | 3.3.1 | 3-5 | 116 | Reword the beginning of this bullet as "Ability to detect the presence" in order to match the format of the preceding bullets |
| D153 | 3.3.2 | 3-6 | 131-132 | On line 131, delete "and". On line 132, insert a new item so that the beginning of this line reads:"studies, and preliminary survey or characterization results, if available" |
| D154 | 3.3.2 | 3-6 | 134 | Delete "concentration" |
| D155 | 3.3.2 | 3-6 | 142-143 | Delete the second occurrence of "the expected concentration range of". Replace line 143 with the following "for any constituent with the potential for causing chemical or radiological interference." |
| D156 | 3.3.3 | 3-6 | 146 | Delete "For many projects" so that the sentence starts with "Typical matrices" Delete "may" |
| D157 | 3.3.3 | 3-6 | 158 | Should refer to Section 3.4, not 3.5 |
| D158 | 3.3.3 | 3-6 | 159 | Delete "of Chapter 6" |
| D159 | 3.3.3 | 3-7 | 160 | Delete "any" |
| D160 | 3.3.3 | 3-7 | 162 | Delete "As previously noted," |
| D161 | 3.3.3 | 3-7 | 164 | Replace "lists" with "list" |
| D162 | 3.3.4 | 3-7 | 169 | Delete "to measure" |
| D163 | 3.3.4 | 3-7 | 170 | Insert "that" or "the one" in the phrase: "One of the best known and easiest relationships to establish is that between" or "the one between" |
| D164 | 3.3.4 | 3-8 | 192-193 | Shorten by stating:"A list of known or potential radionuclide relationships, based upon parent-progeny relationships, previous study results, or process knowledge." |
| D165 | 3.3.6 | 3-8 | 210-211 | Replace "The list should" with "The list is likely to" |
| D166 | 3.3.6 | 3-8 | 214-216 | Shorten these two sentences to read as follows: "Where this is significant uncertainty about the presence or absence of specific radionuclides, the most conservative approach is to leave them on the analyte list, even when there is only..." |
| D167 | 3.3.6 | 3-8 | 221 | Replace "provides" with "results in a list containing" |

| Row | Section | Page | Line | Editorial Review Comment |
|------|---------|------|----------|--|
| D168 | 3.3.7 | 3-9 | 235 | Insert "(MQOs)" at end of sentence. |
| D169 | 3.3.7 | 3-10 | 266 | Move the last sentence to second place, following the italicized first sentence. |
| D170 | 3.3.7 | 3-10 | 272-273 | Replace the second occurrence of "the method performance characteristics" with "them" |
| D171 | 3.3.7 | 3-10 | 280 | Replace both occurrences of "since" with "because" |
| D172 | 3.3.7.1 | 3-12 | 339-345 | Thank you for providing such a clear example! |
| D173 | 3.3.7.1 | 3-12 | 352, 354 | It would be more user-friendly if more distinctly different formats could be used for the subheadings and the Output paragraphs. |
| D174 | 3.3.7.1 | 3-13 | 364 | Italicize or underline "individual items or samples" to emphasize the distinction between this paragraph and the one that starts on line 376 |
| D175 | 3.3.7.1 | 3-13 | 374 | Insert "(MDC)" after "concentration" |
| D176 | 3.3.7.1 | 3-14 | 376 | Italicize or underline "sampled population" to emphasize the distinction between this paragraph and the one that started on line 364 |
| D177 | 3.3.7.1 | 3-14 | 386 | Insert "(MQC)" after "concentration" |
| D178 | 3.3.7.1 | 3-14 | 387 | Insert comma after ""gray region" |
| D179 | 3.3.7.1 | 3-14 | 389 | Replace "since" with "because" |
| D180 | 3.3.7.1 | 3-14 | 393 | Insert comma after ""example" |
| D181 | 3.3.7.1 | 3-14 | 396 | Replace "overemphasis on establishing" (which does not sound quite right) with "establishment of" |
| D182 | 3.3.7.1 | 3-15 | 423 | Suggest adding "and radioactive" between "chemical" and "constituents". |
| D183 | 3.3.7.1 | 3-15 | 406 | Typo? Replace "activity" with "analyte" |
| D184 | 3.3.7.1 | 3-15 | 410 | Replace "since" with "because" |
| D185 | 3.3.7.1 | 3-15 | 413 | Insert word: "This precaution" |
| D186 | 3.3.7.1 | 3-15 | 413 | Replace "prevent" with "minimize the potential for" |
| D187 | 3.3.7.1 | 3-15 | 418 | Delete the second occurrence of "the concentration of" in this sentence |
| D188 | 3.3.7.1 | 3-16 | 440 | Insert proper reference citation after AOAC: "(Youder and Steiner, 1975)" |
| D189 | 3.3.8 | 3-17 | 495 | Replace "determine" with "specify" |
| D190 | 3.3.8 | 3-17 | 498 | Delete second occurrence of "analytical" on this line. |
| D191 | 3.3.8 | 3-18 | 522 | Replace "analysis" with "analytical" |
| D192 | 3.3.12 | 3-22 | 638 | Typo: "parentheses" (I.e., plural) |
| D193 | 3.4 | 3-23 | 654 | Insert "Common" at the beginning of the caption for Table 3.1 |
| D194 | 3.4 | 3-23 | 665-666 | Replace semi-colons with commas |
| D195 | 3.4 | 3-23 | 666-667 | Delete sentence "In general, most solid samples...in the laboratory." |
| D196 | 3.4.2 | 3-25 | 709 | Replace "...; this is discussed in Chapter 10" with "(see section 10.3.2)" |
| D197 | 3.4.3 | 3-26 | 953 | Replace "where" with "if" |
| D198 | 3.6 | 3-27 | 792 | Replace "if it exists" with "if they exist" |
| D199 | 3.5 | 3-28 | 803-804 | Correct section references to "3.3.7" (in 4 places on these two lines) |
| D200 | 3.5 | 3-28 | 807-810 | Correct the four entries under "Evaluation criteria" to refer to "Section 8.5.2" |
| D201 | 3.5 | 3-28 | 807-810 | Correct the four entries under "Frequency" to refer to "Section 3.3.10" |
| D202 | 3.5 | 3-29 | 828 | Insert comma after "analyte" in Row 2 of "Analysis Limitations" |
| D203 | 4.1 | 4-1 | 6 | Insert (APSS) after "Analytical Protocol Specifications" |
| D204 | 5.3.5 | 5-4 | 136 | Think you mean Appendix C |

| Row | Section | Page | Line | Editorial Review Comment |
|------|----------|-------|----------------|---|
| D205 | 6.1 | 6-1 | 30 | 'panning' should be 'planning'. Or perhaps you are talking film criticism. |
| D206 | 8.2.3 | 8-5 | 140 | No comma needed after "Although". |
| D207 | 8.5 | 8-14 | 380 | Excess verbiage. Suggest deleting "reliably identify analytes". |
| D208 | 9.2 | 9-3 | 71 | "rational" should be "rationale". |
| D209 | 10.1.1 | 10-2 | 41 | add comma ...to ensure that modifications, discrepancies and... |
| D210 | 10.3.2 | 10-19 | 581 | correct text: "involve s" should be "involves" |
| D211 | 10.3.2.1 | 10-19 | 611 | Last word should be "turbidity". |
| D212 | 10.3.2.2 | 10-21 | 653 | modify text: Should read: ...advantage of filtering in the field is that acid... |
| D213 | 10.3.3.1 | 10-23 | 725 | modify text: loss of radionuclide from the sample. |
| D214 | 10.3.5 | 10-28 | 895 | Typo: 201/202Th should probably be 228/230/234Th |
| D215 | 10.4 | 10-29 | 918 | Should be "appropriate" without a "d". |
| D216 | 10.5.4.1 | 10-40 | 1327 | Given in traditional units (microCi/mL); should also be in SI. |
| D217 | 11.1 | 11-1 | 5 | Suggest: "...topics are presented sequentially in this chapter..." |
| D218 | 11.1 | 11-1 | 26 | Suggest: "Other relevant issues, including the laboratory's radioactive materials license conditions..." |
| D219 | 11.1 | 11-1 | 27 | Missing part of word at end of line. Should this be "tracking activities"? |
| D220 | 11.2.1 | 11-3 | 33 | Suggest: "...should know the approximate numbers..." |
| D221 | 12 | 12 | General | Overall this chapter is also straightforward and useful. |
| D222 | 12.3 | 12-13 | lowest diamond | Figure 12.2: To be consistent, "aliquot" should be "aliquant". |
| D223 | 12.3.1.3 | 12-25 | 705 | Should "off" be "of"? |
| D224 | 13.1 | 13-1 | 26 | insert "such" between "ensure" and "exchange" |
| D225 | 13.1 | 13-1 | 31 | delete the first sentence |
| D226 | 13.2.1 | 13-3 | 74 | insert "For example", before "the solubility product constant ..." |
| D227 | 13.2.3 | 13-4 | 111 | change "isotope" to "isotopic" |
| D228 | 13.2.3 | 13-4 | 123 | delete the period after "acids" |
| D229 | 13.2.3 | 13-5 | 126 | add a period before "dissolution" |
| D230 | 13.2.3 | 13-5 | 133 | insert "metal" after "soluble" |
| D231 | 13.2.3 | 13-5 | 136 | delete the second "oxidation" |
| D232 | 13.2.4 | 13-5 | 147 | change "cation" to "cations" |
| D233 | 13.2.5 | 13-6 | 170 | change "the method" to "a given separation method" |
| D234 | 13.3 | 13-9 | 261 | replace "for fusions" with "in fusions" |
| D235 | 13.3.1 | 13-11 | 332 | replace "is" with "could be" |
| D236 | 13.3.2 | 13-12 | 352 | delete "rather" |
| D237 | 13.4.1 | 13-17 | 546-553 | this paragraph is an exact duplicate of the one above (lines 538-545) |
| D238 | 13.4.1 | 13-20 | 638 | insert "also" after "they" |
| D239 | 13.5.2 | 13-25 | 804 | delete "However, " and start the sentence with "Waste is minimized ..." |
| D240 | 13.6.3 | 13-27 | 864 | replace "see" with "observe" |
| D241 | 13.7.2 | 13-31 | 963 | Change heading to "Total Dissolution" (i.e., delete "through Fusion"). Add new paragraph at end of Section 13.7.2: "Total dissolution is feasible by dissolution in nitric and hydrofluoric acids at elevated temperature and pressure. Microwave ovens and Parr bombs are used to achieve these conditions." |

| Row | Section | Page | Line | Editorial Review Comment |
|------|-----------|--------|---------|--|
| D242 | 13.7.2 | 13-31 | 994 | Delete extraneous "a" from the sentence "The analyst must consider whether a this sample is representative." |
| D243 | 13.9.1 | 13-36 | 1114 | replace "or" with "from" |
| D244 | 14.1 | 14-1 | 8 | delete "in one reference document" |
| D245 | 14.1 | 14-1 | 13 | replace "employed" with "provided" |
| D246 | 14.1 | 14-1 | 16 | change "afford" to "give" or "provide" |
| D247 | 14.1 | 14-1 | 20 | replace "found" to employed |
| D248 | 14.1 | 14-1 | 30 | delete "for the practicing radiochemist" |
| D249 | 14.1 | 14-2 | 35 | "their" should be "its". |
| D250 | 14.1 | 14-2 | 37 | change "behavior" to "nature" |
| D251 | 14.1 | 14-2 | 48 | delete "modern" and insert "also" after "should" |
| D252 | 14.2.3 | 14-6 | 183-187 | Redundant, see priority rules on p. 14-5. |
| D253 | 14.2.3 | 14-7 | 205 | replace "be obtained" by "occur" |
| D254 | 14.2.3 | 14-7 | 214 | define "M" as the "metal ion" |
| D255 | 14.2.3 | 14-7 | 218 | combine both sentences |
| D256 | 14.8.7 | 14-90 | 2450 | second column: "Sarge" should be "Large". |
| D257 | 14.10.1 | 14-108 | 2975 | Should be "cesium isotope" |
| D258 | 14.10.1 | 14-109 | 3009 | Insert "to attempt " after "employed" |
| D259 | 14.10.1 | 14-109 | 3020 | this paragraph should be shifted down behind line 3045 |
| D260 | 14.10.5 | 14-114 | 3153 | Move "many" to the front of this sentence |
| D261 | 14.10.8 | 14-118 | 3280 | Move "Earths" to left border |
| D262 | 14.10.8 | 14-119 | 3299 | Replace question mark with page numbers |
| D263 | 14.10.9.1 | 14-120 | 3353 | Delete last "a" on line |
| D264 | 14.10.9.2 | 14-127 | 3565 | Delete "and" after "solutions" |
| D265 | 14.10.9.2 | 14-128 | 3587 | Delete "a" before "hydrocarbons" |
| D266 | 14.10.9.3 | 14-130 | 3663 | Replace "principle" with "principal" |
| D267 | 14.10.9.3 | 14-135 | 3826 | Correct typos in "kaolinite", "bentonite", "montmorillonite" |
| D268 | 14.10.9.4 | 14-137 | 3893 | Delete comma after "Chernobyl" |
| D269 | 14.10.9.4 | 14-138 | 3907 | Delete "for" after "analyzed" |
| D270 | 14.10.9.4 | 14-140 | 3988 | Check reference whether the last line on this page in Table 14.19 should be moved to this line |
| D271 | 14.10.9.4 | 14-141 | 3995 | This information should be added to the box at line 3989 |
| D272 | 14.10.9.4 | 14-141 | 4002 | Fix typo in the word "state" after "oxidation" |
| D273 | 14.10.9.4 | 14-141 | 4007 | Move "-1" to exponent in second "I" |
| D274 | 14.10.9.4 | 14-143 | 4056 | Insert "on" after "remain" |
| D275 | 14.10.9.5 | 14-144 | 4086 | Insert comma after "94" |
| D276 | 14.10.9.5 | 14-147 | 4180 | Correct the spelling of "coastal" |
| D277 | 14.10.9.5 | 14-151 | 4303 | Correct verb: "have, not "has" |
| D278 | 14.10.9.5 | 14-151 | 4307 | Correct verb: "are", not "is" |
| D279 | 14.10.9.5 | 14-152 | 4347 | Correct typo: "carbamyolphosphine" |
| D280 | 14.10.9.5 | 14-152 | 4351 | correct typo: "affect", not "effect" |
| D281 | 14.10.9.5 | 14-153 | 4374 | Correct typo: "electrodeposition" |

| Row | Section | Page | Line | Editorial Review Comment |
|------|------------|--------|---------|---|
| D282 | 14.10.9.6 | 14-154 | 4431 | Insert comma after "part" |
| D283 | 14.10.9.6 | 14-157 | 4523 | Delete "their" |
| D284 | 14.10.9.6 | 14-159 | 4595 | Correct verb: "absorb", not "absorbs" |
| D285 | 14.10.9.6 | 14-160 | 4626 | Delete "however" and begin a new sentence |
| D286 | 14.10.9.7 | 14-169 | 4888 | Correct spelling: "principal" |
| D287 | 14.10.9.8 | 14-169 | 4891 | This heading is "Solubility of Compounds" for other radionuclides |
| D288 | 14.10.9.8 | 14-171 | 4960 | Delete "to" at end of line |
| D289 | 14.10.9.8 | 14-173 | 5025 | correct typo: "exchanged" instead of "exchange" |
| D290 | 14.10.9.8 | 14-173 | 5029 | Correct typo: "called" instead of "call" |
| D291 | 14.10.9.10 | 14-181 | 5287 | Correct typo: "release" instead of "releasing" |
| D292 | 14.10.9.10 | 14-181 | 5296 | Correct verb: "are" instead of "is" |
| D293 | 14.10.9.11 | 14-192 | 5638 | First word is "from" (sp.) |
| D294 | 14.10.9.11 | 14-194 | 5700 | Correct typo: "used" instead of "use" |
| D295 | 14.10.9.11 | 14-194 | 5712 | correct typo: "carbamyolphosphine" |
| D296 | 14.10.9.11 | 14-195 | 5739 | Add comma after "acid" |
| D297 | 14.10.9.11 | 14-195 | 5747 | Insert period after "acid" |
| D298 | 14.10.9.11 | 14-196 | 5764 | Correct typo: "exists" instead of "exist" |
| D299 | 14.10.9.12 | 14-199 | 5865 | Delete comma after "mercury" |
| D300 | 14.10.9.12 | 14-199 | 5884 | Delete either "is" or "becomes" after "metal" |
| D301 | 14.10.9.12 | 14-203 | 6006 | Correct typo: "used" instead of "use" |
| D302 | 14.10.9.12 | 14-203 | 6007 | Correct typo: "from" instead of "form" |
| D303 | 14.10.9.12 | 14-203 | 6011 | Correct typo: "tracer" instead of "tracers" |
| D304 | 14.10.9.12 | 14-204 | 6031 | Correct typo: "from" instead of "form" |
| D305 | 14.11 | 14-205 | 6068 | correct typo: "Health" |
| D306 | 14.11 | 14-208 | 6157 | Correct typo: "Horwitz" |
| D307 | 14.11 | 14-214 | 6300 | Correct typo: "Nuclear" |
| D308 | 14.11 | 14-216 | 6365 | Delete this duplicate of the reference on line 6363 |
| D309 | 14.11 | 14-221 | 6497 | Correct typo: "Nuclei" |
| D310 | 15.2.2.3 | 15-5 | 129 | Correct typo: "vent" should be "event" |
| D311 | 15.3.3 | 15-9 | 274 | the comma should be a dash. |
| D312 | 15.3.6 | 15-11 | 324 | Insert a comma after "power supply". |
| D313 | 15.4.1 | 15-15 | 461 | '... the data is ...' should be "... the data are..." |
| D314 | 15.7 | 15-24 | 731 | Delete hyphen from ion-chambers. |
| D315 | 15.7 | 15-27 | 839 | Plural "minutes" should be singular "minute". |
| D316 | 15.7 | 15-27 | | Figure 15.7: Vertical axis label and peak label are illegible |
| D317 | 15.7 | 15-27 | | Figure 15.8: Vertical axis label and peak label are illegible |
| D318 | 15.7 | 15-28 | 863-864 | Incomplete sentence; I suspect one or more lines or line segments got left out. |
| D319 | 15.10.1.1 | 15-33 | 1014 | Need "is" between contamination and dominated. |
| D320 | 15.10.1.1 | 15-33 | 1029 | "a-producing" should be "alpha-producing" (Greek letter OK). |
| D321 | 15.10.1.1 | 15-34 | 1044 | "if" should be "in". |

| Row | Section | Page | Line | Editorial Review Comment |
|------|-----------|-------|------------|--|
| D322 | 15.10.1.1 | 15-34 | 1051-1052 | 'effected' should be 'affected' (two places). |
| D323 | 15.10.1.2 | 15-35 | 1076 | Put comma after second "sample". |
| D324 | 15.10.1.2 | 15-35 | 1077 | Put semicolon or dash after "made". |
| D325 | 15.10.1.2 | 15-35 | 1082 | Put semicolon after "available". |
| D326 | 15.10.1.3 | 15-36 | 1113, 1117 | For consistency, "P10" should probably be "(super 10)P". |
| D327 | 15.10.1.4 | 15-37 | 1129 | 'ore' should be 'or'. |
| D328 | 15.10.2.2 | 15-41 | 1267 | Change "large" to "larger" |
| D329 | 15.10.2.2 | 15-41 | 1267 | Insert "to" after "rise". |
| D330 | 15.10.3.1 | 15-46 | 1413 | 'See page 51...' should be "See page 15-51 ..." |
| D331 | 15.10.3.1 | 15-46 | 1413 | '... list items ...' should be "... list of items ..." |
| D332 | 15.10.3.1 | 15-46 | 1419 | NIM should be defined in "poorly conditioned NIM power" |
| D333 | 15.10.3.1 | 15-47 | 1443 | End this line with a colon as a lead in to eqn 15.2? |
| D334 | 15.10.3.4 | 15-50 | 1522 | 75 x 75 mm (3 x 3 in) |
| D335 | 15.10.3.5 | 15-51 | 1566 | 'nim' should be "NIM" |
| D336 | 15.10.4.2 | 15-53 | 1626 | 'signal' should be "signals" to match "they" in line 1627. |
| D337 | 15.10.4.3 | 15-55 | 1672 | 'Neutron Activation analysis method was employed...' should be either "The Neutron Activation Analysis method was employed..." or "Neutron Activation Analysis was employed..." |
| D338 | 15A.2 | 15-64 | 1909 | insert "a" after "as". |
| D339 | 16.3.4 | 16-8 | 232-234 | uses "inch" to describe planchet size. I'm OK with that, but it's not SI. |
| D340 | 16.5.2.1 | 16-17 | 524-526 | Shouldn't "aliquant" be "aliquot"? (same question arises in other parts of this chapter) |
| D341 | 16.7.1 | 16-20 | 615 | Insert "alpha" between High-resolution and spectroscopy. |
| D342 | 16.7.3 | 16-25 | 771 | Shouldn't "aliquant" be "aliquot"? (same question arises in other parts of this chapter) |
| D343 | 17.1 | 17-2 | 40, 988 | Correction of reference: '(ANSI 42.23, 1996; p.38):' |
| D344 | 17.2.1 | 17-3 | 88 | Addition of letter s : '...parameter adjustments may be required for some or all of the samples received. The number of...' |
| D345 | 17.2 | 17-3 | 62, 63 | Addition of comma and modification of text: "...often as possible, to avoid the inherent errors associated with manual transfer. On the other hand, electronic transfers need to be scrutinized, so as to assure that the data are not corrupted. Following this procedure, the next step in the data reduction process may be performed manually, i.e., with a calculator." |
| D346 | 17.2.2 | 17-7 | 192 | Deletion of superscript 2: "This calculates the radionuclide concentration at the time of sample collection. It compensates..." |
| D347 | 17.2.2 | 17-7 | 194 | Addition of superscript 2: "...counting, when the counting duration is a significant fraction of the half-life ² . For long-lived..." |
| D348 | 17.3 | 17-8 | 215 | Deletion of letter s : '...for these purposes and can be applied to the analysis of a wide range of radionuclides. Energy...' |
| D349 | 17.3 | 17-8 | 228 | Deletion of letter d : '...Sanderson, 1992). A method of performance...' |
| D350 | 17.3 | 17-8 | 229 | Change in reference: 'ANSI N42.14 (1991). |
| D351 | 17.3.1 | 17-9 | 258 ff | Deletion of letter m: '...Gilmore and Hemingway, 1995...' (lines 258, 314, 320, 326, 343, 363, 368, 403, 515, 522, 541) |
| D352 | 17.3.1.8 | 17-20 | 504 | Deletion of word is: '...time, and (2) true coincidence summing, due to the simultaneous emission of gamma-rays by a... |
| D353 | 17.3.1.8 | 17-21 | 509 | Addition of comma , (2x): 'having a count in both full-energy peaks, a count will occur somewhere else in the spectrum, equal...' |
| D354 | 17.3.1.8 | 17-21 | 511 | Addition of comma : '...interactions, e.g., photoelectric with Compton, and Compton and Compton. Since this |

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| | | | | occurs...' |
| D355 | 17.3.1.8 | 17-21 | 522 | Correction of reference: '...If unknown, the resolving time can be estimated by a method similar to that described in Gilmore and Hemingway (1995).' |
| D356 | 17.3.2 | 17-23 | 582 | Deletion of letter s: '...to have alpha spectrometry software to identify radionuclides, subtract background, perform...' |
| D357 | 17.3.2 | 17-27 | 683 | Deletion of letter n: 'The FWHM of a given peak may depend greatly on the source preparation. However, since a...' |
| D358 | 17.3.3.1 | 17-29 | 746 | Correction of references: '...developed over the years (Holm et al., 1984; Harvey and Sutton, 1970).' |
| D359 | 17.3.3.3 | 17-30 | 773 | Deletion of word of: '...decay pulse are the basis for discrimination alpha particles from beta and gamma radiation in...' |
| D360 | 17.3.3.8 | 17-32 | 824 | Addition of comma , : '...counter efficiency4. If the internal (standards addition) method is used, the data generated by the...' |
| D361 | 17.5.4 | 17-39 | 988 | Correction of reference: '(ANSI 42.23, 1996; p.38).' |
| D362 | 17.8.2 | 17-43 | 1104-1105 | Harvey, B.R., and Sutton, G.A., 1970... This reference is full of typos. |
| D363 | 17.8.2 | 17-44 | 1122 | Quittner, P., 1972... This reference is incomplete (needs page numbers). |
| D364 | 18.1 | 18-1 | 11 | Correction of reference: "...laboratory. General requirements for testing laboratories can be found in ISO/IEC 17025 (1999)." |
| D365 | 18.3.2 | 18-6 | 156 | Correction of reference: '...almost any distribution (ISO 8258, publication date). However, when data obtained from radiation counters are...' |
| D366 | 18.3.2 | 18-6 | 164 | Correction of reference: '...ASTM D6299 (2000). Standard Practice for Applying Statistical Quality Assurance Techniques to...' |
| D367 | 18.3.2 | 18-6 | 166 | Correction of reference: '...ASTM E882 (publication date). Standard Guide for Accountability and Quality Control in the Chemical...' |
| D368 | 18.3.2 | 18-6 | 169 | Correction of reference: '...ISO 7870 (publication date). Control Charts—General Guide and Introduction.' |
| D369 | 18.3.2 | 18-6 | 170 | Correction of reference: '...ISO 7873 (publication date).. Control Charts for Arithmetic Average with Warning Limits.' |
| D370 | 18.3.2 | 18-6 | 171 | Correction of reference: '...ISO 7966 (publication date). Acceptance Control Charts.' |
| D371 | 18.3.2 | 18-6 | 172 | Correction of reference: '...ISO 8258 (publication date). Shewhart Control Charts.' |
| D372 | 18.3.2 | 18-7 | 173-174 | Correction of reference: '...American Society for Testing and Materials (ASTM) MNL 7. 1990. Manual on Presentation of Data and Control Chart Analysis ASTM Manual Series, 6th Edition, 1990.' |
| D373 | 18.5 | 18-25 | 711 | Correction of reference: '...specific techniques, see Chapters 15 and 16 as well as ASTM standard practices (e.g., ASTM D3648, (1995), for...' |
| D374 | 18.5.1 | 18-26 | 756 | Correction of reference: '...performed on a real time basis. See ASTM E18 (publication date), ANSI N42.12 (publication date), and NELAC (2000) Quality...' |
| D375 | 18.5.2 | 18-28 | 813 | Correction of reference: '...instrument dead time is not significant and gain shifts do not occur (ANSI 42.23, 1996). For detection...' |
| D376 | 18.5.2 | 18-28 | 830 | Correction of reference: '...fraction of the emissions from the source actually reach the detector (ANSI N15.37, 1981).' |
| D377 | 18.5.2 | 18-29 | 835 | Correction of reference: '...sample container, detector housing and shielding (NCRP 58, 1985).' |
| D378 | 18.5.6 | 18-41 | 1216 | Change to "readers" to agree with "their". |
| D379 | 18.5.6 | 18-42 | 1218 | Correction of reference: '...given in ASTM E181 (publication date) and ANSI N42.12 (publication date).' |
| D380 | 18.5.6 | 18-43 | Table 18.5 | Instrument calibration: example frequency and performance criteria: At the base of the Table, on the bottom left, Sources should read: ASTM E181 (date of publication); ANSI N42.12 (date of publication). |
| D381 | 18.6.7 | 18-54 | 1615 | Correction of reference: '...service. Ordinarily, ASTM E617 (1997) Class 1 or 2 weights are used to perform the daily |

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| | | | | calibration...' |
| D382 | 18.6.7 | 18-54 | 1631 | Correction of reference: '...specified in ASTM E542 (2000). Typically calibrations use volumes of water and are gravimetrically...' |
| D383 | 18.7.1 | 18-55 | 1643-1645 | American National Standards Institute/International Standards Organization/American Society for Quality Control (ANSI/ISO/ASQC) A3534-2. (publication date). |
| D384 | 18.7.1 | 18-55 | 1649-1650 | American National Standards Institute (ANSI) N1.1. (1976). |
| D385 | 18.7.1 | 18-56 | 1679-1680 | International Standards Organization (ISO) 7873. (publication date).(date). |
| D386 | 18.7.1 | 18-57 | 1701-1702 | National Bureau of Standards (NBS). 1964. |
| D387 | 18.7.1 | 18-57 | 1703-1704 | U.S. Environmental Protection Agency (EPA). 1977. |
| D388 | 18.7.1 | 18-57 | 1705-1707 | U.S. Environmental Protection Agency (EPA). 1980. |
| D389 | 18A | 18-61 | 1768 | Correction of reference: '...moving range (ASTM D6299, 2000,; ASTM E882, publication date). The moving range (MR) is the absolute value of...' |
| D390 | 18A | 18-65 | 1838 | Correction of reference: '...Analysis (ASTM MNL7, 1990), as well as many other references. |
| D391 | 18A | 18-65 | 1855 | Correction of reference: '...give no more than 1 percent Poisson counting uncertainty (ANSI N42.23, 1996). In other words, at...' |
| D392 | 18A | 18-70 | 1955-1956 | American National Standards Institute (ANSI) N42.23, 1996. Measurement and Associated Instrumentation Quality Assurance for Radioassay Laboratories. 1996. |
| D393 | 18A | 18-70 | 1958-1960 | American Society for Testing and Materials (ASTM) D6299, 2000. |
| D394 | 18A | 18-70 | 1961-1962 | American Society for Testing and Materials (ASTM) E882, (publication date) |
| D395 | 18A | 18-70 | 1963-1964 | American Society for Testing and Materials (ASTM) MNL 7, 1990. |
| D396 | 19.3.1 | 19-8 | 206 | What's a "GUM"? Add to Glossary? |
| D397 | 20.2 | 20-1 | 26 | multiservice |
| D398 | 20.2 | 20-1 | 28 | nonradioactive |
| D399 | 20 | All | | Good flow, well written etc |
| D400 | 20.2 | 20-2 | Table 20.1 | row three, degreasers; row 14, biphenyls |
| D401 | 20.4 | 20-4 | 92 | nonradioactive |
| D402 | 20.4 | 20-4 | 93 | nonradioactive |
| D403 | 20.4 | 20-4 | 97 | nonradioactive |
| D404 | 20.4 | 20-5 | 123 | nonhazardous |
| D405 | 20.4 | 20-5 | 130 | microscale |
| D406 | 20.4 | 20-6 | 137 | nonhazardous |
| D407 | 20.4 | 20-6 | 140 | reuse |
| D408 | 20.4 | 20-6 | 145 | nonradioactive |
| D409 | 20.4 | 20-6 | 152 | nonradioactive |
| D410 | 20.4 | 20-6 | 153 | nonradioactive |
| D411 | 20.6 | 20-7 | 180 | should AEA be written out? |
| D412 | 20.7.1 | 20-14 | 393 | Somehow what was supposed to be a comma came out "B". |
| D413 | | All | | Some of the tables are cut in the middle because of placement on the page. Presumably this will be addressed in the final version of the document. |

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| D414 | | All | | Text in some of the flow charts is too small in many cases and unreadable in a few cases |
| D415 | | All | | The arrow symbol (-->) throughout the entire report is too small in size. |
| D416 | B3.2 | B-5 | 125 | Comma after (TEDE) should be a semicolon. |
| D417 | B3.7 | B-11 | 306 | Suggest inserting "is understood as" before "making". |
| D418 | F | All | | This appendix is thought-provoking and is a step toward quantifying uncertainty in sub-sampling, despite the disclaimers. |